IBM System x3550 M4 Type 7914

Installation and User's Guide

IBM System x3550 M4 Type 7914

Installation and User's Guide

Note: Before using this information and the product it supports, read the information in Appendix B, “Notices,” on page 127, the *IBM Safety Information* and *Environmental Notices and User Guide* documents on the IBM *Documentation* CD, and the *Warranty Information* document.

The most recent version of this document is available at http://www.ibm.com/supportportal/.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information
（安全信息）。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

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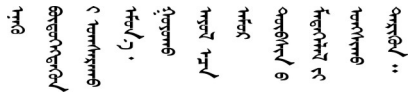


ཐོན་རྫས་འདི་བདེ་སྒྲིད་མ་བྱས་གོང་། ཁྱོད་ཀྱི་ཡིད་གཟབ་
བྱ་འདྲ་མིན་ཡོད་པའི་འཛོད་སྣེར་བཤུ་དགོས།

ھەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen canjbinj soengq cungj vahgangj ancien siusik.

Important:

Each caution and danger statement in this documentation is labeled with a number. This number is used to cross reference an English language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled "Statement 1," translations for that caution statement are in the *Safety Information* document under "Statement 1."

Be sure to read all caution and danger statements in this document before you perform the procedures. Read any additional safety information that comes with the server or optional device before you install the device.

Attention: Use No. 26 AWG or larger UL-listed or CSA certified telecommunication line cord.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 2:

CAUTION:
When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

Statement 4:

≥ 18 kg (39.7 lb.)

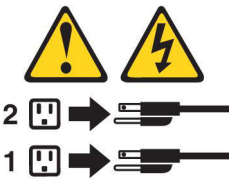
≥ 32 kg (70.5 lb.)

≥ 55 kg (121.2 lb.)

CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 6:

CAUTION:
Do not place any objects on top of a rack-mounted device unless that rack-mounted device is intended for use as a shelf.

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 12:

CAUTION:
The following label indicates a hot surface nearby.

Statement 26:

CAUTION:
Do not place any object on top of rack-mounted devices.

This server is suitable for use on an IT power-distribution system whose maximum phase-to-phase voltage is 240 V under any distribution fault condition.

Statement 27:

CAUTION:
Hazardous moving parts are nearby.

Chapter 1. The System x3550 M4 server

This *Installation and User's Guide* contains information and instructions for setting up your IBM System x3550 M4 Type 7914 server, instructions for installing some optional devices, and instructions for cabling, and configuring the server. For removing and installing optional devices, diagnostics and troubleshooting information, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD, which comes with the server.

In addition to the instructions in Chapter 2, “Installing optional devices,” on page 31 for installing optional hardware devices, updating firmware and device drivers, and completing the installation, IBM Business Partners must also complete the steps in “Instructions for IBM Business Partners” on page 31.

The IBM® System x3550 M4 Type 7914 server is a 1-U-high[1] rack model server for high-volume network transaction processing. This high-performance, multi-core server is ideally suited for networking environments that require superior microprocessor performance, input/output (I/O) flexibility, and high manageability.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of the server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

The server comes with a limited warranty. For information about the terms of the warranty, see the *Warranty Information* document that comes with the server.

The server contains IBM X-Architecture® technologies, which help increase performance and reliability. For more information, see “What your server offers” on page 8 and “Reliability, availability, and serviceability” on page 11.

You can obtain up-to-date information about the server and other IBM server products at http://www.ibm.com/systems/x/. At http://www.ibm.com/support/mysupport/, you can create a personalized support page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly e-mail notifications about new technical documents, search for information and downloads, and access various administrative services.

If you participate in the IBM client reference program, you can share information about your use of technology, best practices, and innovative solutions; build a professional network; and gain visibility for your business. For more information about the IBM client reference program, see http://www.ibm.com/ibm/clientreference/.

If firmware and documentation updates are available, you can download them from the IBM website. The server might have features that are not described in the documentation that comes with the server, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. To check for updates, go to http://www.ibm.com/supportportal/.

1. Racks are marked in vertical increments of 1.75 inches each. Each increment is referred to as a unit, or a “U”. A 1-U-high device is approximately 1.75 inches tall.

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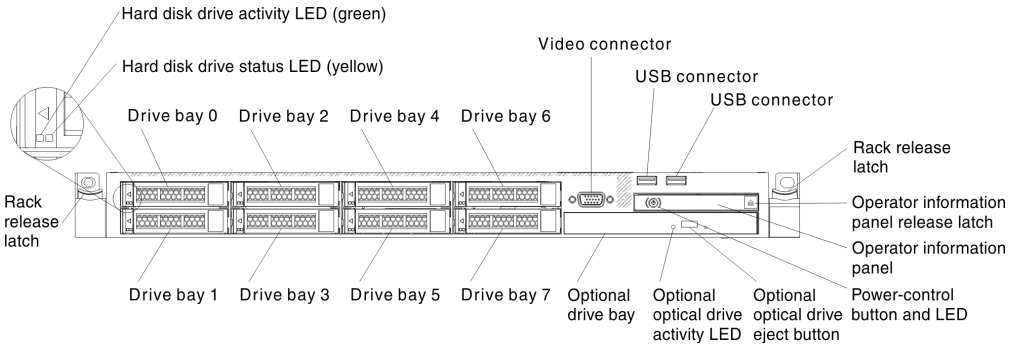
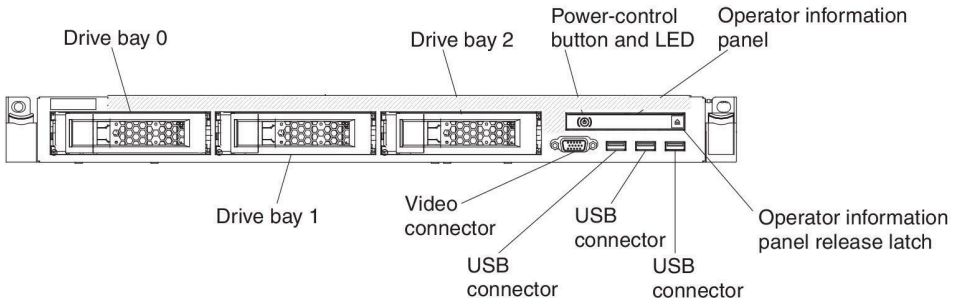
Note: The illustrations in this document might differ slightly from your model.

The hot-swap server models support up to eight 2.5-inch hot-swap SAS/SATA hard disk drives or three 3.5-inch hot-swap SAS/SATA hard disk drives. The simple-swap server models support up to three 3.5-inch simple-swap SATA hard disk drives. The following illustration shows the 2.5-inch hot-swap server models with an optional optical drive bay.



The following illustration shows the 3.5-inch hot-swap or simple-swap server models. The servers support up to three 3.5-inch hot-swap SAS/SATA or simple-swap SATA hard disk drives.



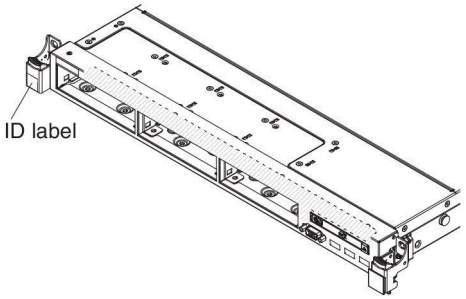
If firmware and documentation updates are available, you can download them from the IBM website. The server might have features that are not described in the documentation that comes with the server, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. To check for updates, go to http://www.ibm.com/supportportal/.

Record information about the server in the following table.

Product name	IBM System x3550 M4 server
Machine type	7914
Model number	_____
Serial number	_____

The model number and serial number are on the ID label on the front of the server, as shown in the following illustration.

Note: The illustrations in this document might differ slightly from your hardware.



You can download an IBM *ServerGuide Setup and Installation* CD to help you configure the hardware, install device drivers, and install the operating system.

For a list of supported optional devices for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

See the *Rack Installation Instructions* document on the IBM *System x Documentation* CD for complete rack installation and removal instructions.

The IBM System x Documentation CD

The IBM *System x Documentation* CD contains documentation for the server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *System x Documentation* CD requires the following minimum hardware and software:

- Microsoft Windows XP, Windows 2000, or Red Hat Linux
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your server and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD or DVD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
  - If you are using a Windows operating system, insert the CD into the CD or DVD drive and click **Start -> Run**. In the **Open** field, type

    ```
    e:\win32.bat
    ```

    where *e* is the drive letter of the CD or DVD drive, and click **OK**.

– If you are using Red Hat Linux, insert the CD into the CD or DVD drive; then, run the following command from the /mnt/cdrom directory:

```
sh runlinux.sh
```

Select the server from the **Product** menu. The **Available Topics** list displays all the documents for the server. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document is displayed under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Crtl+F to use the Acrobat search function, or press Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

Related documentation

This *Installation and User's Guide* contains general information about the server including how to set up and cabling the server, how to install supported optional devices, and how to configure the server. The following documentation also comes with the server:

- *Environmental Notices and User Guide*

  This document is in PDF on the IBM *System x Documentation* CD. It contains translated environmental notices.
- *IBM License Agreement for Machine Code*

  This document is in PDF. It provides translated versions of the *IBM License Agreement for Machine Code* for your product.
- *IBM Warranty Information*

  This printed document contains the warranty terms and a pointer to the IBM Statement of Limited Warranty on the IBM website.
- *Licenses and Attributions Documents*

  This document is in PDF. It provides the open-source notices.
- *Problem Determination and Service Guide*

  This document is in PDF on the IBM *System x Documentation* CD. It contains information to help you solve problems yourself, and it contains information for service technicians.
- *Rack Installation Instructions*

  This printed document contains instructions for installing the server in a rack and comes with the rack kit.
- *Safety Information*

  This document is in PDF on the IBM *System x Documentation* CD. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

Depending on the server model, additional documentation might be included on the IBM *System x Documentation* CD.

The System x and BladeCenter Tools Center is an online information center that contains information about tools for updating, managing, and deploying firmware, device drivers, and operating systems. The System x and BladeCenter Tools Center is at http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp.

The server might have features that are not described in the documentation that you received with the server. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. These updates are available from the IBM website. To check for updates, go to http://www.ibm.com/supportportal/.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the IBM *System x Documentation* CD. Each statement is numbered for reference to the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following information is a summary of the features and specifications of the server. Depending on the model, some features might not be available, or some specifications might not apply.

Table 1. Features and specifications

Microprocessor:

- Supports up to two Intel Xeon™ E5-2600 series multi-core microprocessors (one installed)
- Level-3 cache
- Two QuickPath Interconnect (QPI) links speed up to 8.0 GT per second

Note:

- Use the Setup utility program to determine the type and speed of the microprocessors.
- For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Memory:

- Minimum: 2 GB
- Maximum: 768 GB
  - 64 GB using unbuffered DIMMs (UDIMMs)
  - 384 GB using registered DIMMs (RDIMMs)
  - 768 GB using load reduction DIMMs (LRDIMMs)
- Type:
  - PC3-8500 (DDR3-1066), PC3-10600 (DDR3-1333), or PC3-12800 (DDR3-1600)
  - Single-rank, dual-rank, or quad-rank
  - Registered DIMM (RDIMM), unbuffered DIMM (UDIMM), or load reduced DIMM (LRDIMM)
- Slots: 24 dual inline
- Supports (depending on the model):
  - 4 GB unbuffered DIMM
  - 2 GB, 4 GB, 8 GB, and 16 GB registered DIMMs
  - 32 GB load reduction DIMM

SATA optical drives (optional for 2.5-inch models):

- DVD-ROM
- Multi-burner

Hot-swap fans:

- One microprocessor: 4 dual-motor hot-swap fans.
- Two microprocessors: 6 dual-motor hot-swap fans.

Hard disk drive expansion bays (depending on the model):

- 2.5-inch models: Up to eight 2.5-inch hot-swap SAS/SATA hard disk drive bays (with an optional optical drive bay)
- 3.5-inch models: Up to three 3.5-inch hot-swap SAS/SATA or simple-swap SATA hard disk drive bays

PCI expansion slots:

Supports two PCI riser slots:

- Slot 1 supports low-profile cards.
  - PCI Express 3.0 x16
- Slot 2 supports half-length, full-height cards.
  - PCI Express 3.0 x8
  - PCI Express 3.0 x16 (two microprocessors installed)
  - PCI-X 64-bit/133 MHz

Video controller (integrated into IMM2):

- Matrox G200eR2
  Note: The maximum video resolution is 1600 x 1200 at 75 Hz.
  - SVGA compatible video controller
  - DDR3 528 MHz SDRAM video memory controller
  - Avocent Digital Video Compression
  - 16 MB of video memory (not expandable)

Power supply:

- Up to two hot-swap power supplies for redundancy support
  - 550-watt ac
  - 750-watt ac
  - 750-watt dc

Note: Power supplies in the server must be with the same power rating or wattage.

Environment: compliant with ASHRAE class A3 specifications.

Server on:

- Temperature:
  - 5°C to 40°C (41°F to 104°F)
  - Altitude: 0 to 950 m (3,117 ft); decrease the maximum system temperature by 1°C for every 175-m increase in altitude.
- Maximum altitude: 3,050 m (10,000 ft), 5°C to 28°C (41°F to 82°F)
- Humidity:
  - Non-condensing: -12°C dew point (10.4°F)
  - Relative humidity: 8% to 85%
- Maximum dew point: 24°C (75°F)
- Maximum rate of temperature change:
  - Tape drives: 5°C/hr (41°F/hr)
  - Hard disk drives: 20°C/hr (68°F/hr)

Server off:

- Temperature: 5°C to 45°C (41°F to 113°F)
- Relative humidity: 8% to 85%
- Maximum dew point: 27°C (80.6°F)

Storage (non-operating):

- Temperature: 1°C to 60°C (33.8°F to 140.0°F)
- Maximum altitude: 3,050 m (10,000 ft)
- Relative humidity: 5% to 80%
- Maximum dew point: 29°C (84.2°F)

Shipment (non-operating):

- Temperature: -40°C to 60°C (-40°F to 140.0°F)
- Maximum altitude: 10,700 m (35,105 ft)
- Relative humidity: 5% to 100%
- Maximum dew point: 29°C (84.2°F)

Particulate contamination: airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see “Particulate contamination” on page 129.

Table 1. Features and specifications (continued)

Attention:
- Design to ASHRAE Class A3, ambient of 40°C, with relaxed support:
  - Support cloud like workload with no performance degradation acceptable (Turbo-Off)
  - Under no circumstance, can any combination of worst case workload and configuration result in system shutdown or design exposure at 40°C
- Specific microprocessors supported environment:
  - Microprocessor Intel Xeon E5-2690, 135W:
    - Temperature: 10°C to 27°C (41.0°F to 80.6°F)
    - Altitude: 0 to 304.8 m (1,000 ft)
  - Microprocessor models with 115W and 130W:
    - Temperature: 10°C to 35°C (50°F to 95°F)
    - Altitude: 0 to 914.4 m (3,000 ft)

Integrated functions:
- Integrated Management Module II (IMM2), which consolidates multiple management functions in a single chip.
- Intel I350AM4 Quad Port Gigabit Ethernet controller with Wake on LAN support
- Eight Universal Serial Bus (USB) ports for 3.5-inch models. Seven Universal Serial Bus (USB) ports for 2.5-inch models. One port is for optional USB flash device with embedded hypervisor software is installed.
- Six network ports (four 1 Gb Ethernet ports on the system board and two additional ports when the optional IBM Dual-Port 10 Gb Network Adapter is installed)
- One System Management 1 Gb Ethernet port on the rear connected to a systems management network. This system management connector is dedicated to the IMM2 functions.
- One serial port

RAID controllers (depending on the model):
- A ServeRAID H1110 SAS/SATA adapter that provides RAID 0, 1, and 10.
- A ServeRAID M1115 SAS/SATA adapter that provides RAID 0, 1, and 10 with optional FoD RAID 5/50 and SED (Self Encrypting Drive) upgrade.
- A ServeRAID M5110 SAS/SATA adapter that provides RAID 0, 1, and 10.
  Optional upgrade:
  - RAID 5/50 (512 MB Cache) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 (512 MB Flash) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 (1 GB Flash) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 and SED (Zero Cache)
- A ServeRAID M5120 SAS/SATA adapter that provides RAID 0, 1, and 10.
  Optional upgrade:
  - RAID 5/50 (512 MB Cache) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 (512 MB Flash) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 (1 GB Flash) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 and SED (Zero Cache)

Size:
- 1U
- Height: 43 mm (1.7 inches)
- Depth: 734 mm (28.9 inches)
- Width: 429 mm (16.9 inches)
- Weight: approximately 16.4 kg (36.16 lb) when fully configured

Heat output:

Approximate heat output:
- Minimum configuration: 461 Btu per hour (AC 135 watts)
- Maximum configuration: 2900 Btu per hour (AC 850 watts)

Acoustical noise emissions:
- Sound power, idling: 6.2 bels maximum
- Sound power, operating: 6.5 bels maximum

Electrical input:
- Sine-wave input (50 - 60 Hz) required
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Input kilovolt-amperes (kVA), approximately:
  - Minimum: 0.14 kVA
  - Maximum: 0.90 kVA

Notes:
1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.
2. The noise emission level stated is the declared (upper limit) sound power level, in bels, for a random sample of machines. All measurements are made in accordance with ISO 7779 and reported in conformance with ISO 9296.

What your server offers

The server uses the following features and technologies:

- **Features on Demand**

  If a Features on Demand feature is integrated in the server or in an optional device that is installed in the server, you can purchase an activation key to activate the feature. For information about Features on Demand, see http://www.ibm.com/systems/x/fod/.

- **Integrated Management Module II**

  The integrated management module II (IMM2) is the second generation of the IMM. The IMM2 is the common management controller for IBM System x hardware. The IMM2 consolidates multiple management functions in a single chip on the server system board.

  Some of the features that are unique to the IMM2 are enhanced performance, expanded compatibility with blade servers, higher-resolution remote video, expanded security options, and Feature on Demand enablement for hardware and firmware options.

  For additional information, see “Using the integrated management module II” on page 115.

- **UEFI-compliant server firmware**

  IBM System x Server Firmware (server firmware) offers several features, including Unified Extensible Firmware Interface (UEFI) 2.1 compliance; Active Energy Manager technology; enhanced reliability, availability, and serviceability (RAS) capabilities; and basic input/output system (BIOS) compatibility support. UEFI replaces the BIOS and defines a standard interface between the operating system, platform firmware, and external devices. UEFI-compliant System x servers are capable of booting UEFI-compliant operating systems, BIOS-based operating systems, and BIOS-based adapters as well as UEFI-compliant adapters.

  Note: The server does not support DOS (Disk Operating System).

- **IBM Dynamic System Analysis Preboot diagnostics programs**

  The Dynamic System Analysis (DSA) Preboot diagnostics programs are stored on the integrated USB memory. It collects and analyzes system information to aid in diagnosing server problems. The diagnostic programs collect the following information about the server:

  – System configuration
  – Network interfaces and settings
  – Installed hardware
  – Light path diagnostics status
  – Service processor status and configuration
  – Vital product data, firmware, and UEFI (formerly BIOS) configuration
  – Hard disk drive health
  – RAID controller configuration
  – Event logs for ServeRAID controllers and service processors

  The diagnostic programs create a merged log that includes events from all collected logs. The information is collected into a file that you can send to IBM service and support. Additionally, you can view the information locally through a generated text report file. You can also copy the log to a removable media and view the log from a web browser.

For additional information about DSA Preboot diagnostics, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD

- **Multi-core processing**

  The server supports up to two Intel Xeon™ E5-2600 series multi-core microprocessors. The server comes with only one microprocessor installed.

- **IBM Systems Director**

  IBM Systems Director is a workgroup-hardware-management tool that you can use to centrally manage System x and xSeries servers. For more information, see the IBM Systems Director Information Center at http://publib.boulder.ibm.com/infocenter/director/v6r1x/index.jsp?topic=/director_6.1/fqm0_main.html and "IBM Systems Director" on page 12.

- **IBM X-Architecture technology**

  IBM X-Architecture technology combines proven, innovative IBM designs to make your Intel-processor-based server powerful, scalable, and reliable. For more information, see http://www.ibm.com/servers/eserver/xseries/xarchitecture/enterprise/index.html.

  – **Active™ Memory**

    The Active Memory feature improves the reliability of memory through memory mirrored channel mode. Memory mirrored channel mode replicates and stores data on two pairs of DIMMs within two channels simultaneously. If a failure occurs, the memory controller switches from the primary pair of memory DIMMs to the backup pair of DIMMs. For more information about installing DIMMs for memory mirrored channel mode, see "Installing a memory module" on page 59.

  – **Large system-memory capacity**

    The memory bus supports up to 384 GB of system memory when registered DIMMs are installed. The server supports up to 64 GB if unbuffered DIMMs are installed. The memory controller supports error correcting code (ECC) for up to 24 industry-standard PC3-8500 (DDR3-1066), PC3-10600 (DDR3-1333), or PC3-12800 (DDR3-1600), DDR3 (third-generation double-data-rate), synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

- **IBM *ServerGuide Setup and Installation* CD**

  The *ServerGuide Setup and Installation* CD, which you can download from the web, provides programs to help you set up the server and install a Windows operating system. The ServerGuide program detects installed optional hardware devices and provides the correct configuration programs and device drivers. For more information about the *ServerGuide Setup and Installation* CD, see "Using the ServerGuide Setup and Installation CD" on page 106.

- **Integrated network support**

  The server comes with an integrated dual-port Intel Gigabit Ethernet controller, which supports connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network. For more information, see “Configuring the Ethernet controller” on page 119.
- **Integrated Trusted Platform Module (TPM)**

  This integrated security chip performs cryptographic functions and stores private and public secure keys. It provides the hardware support for the Trusted Computing Group (TCG) specification. You can download the software to support the TCG specification, when the software is available. See http://www.ibm.com/servers/eserver/xseries/scalable_family.html for details about the TPM implementation. You can enable TPM support through the Setup utility under the **System Security** menu option.
- **Large data-storage capacity and hot-swap capability**

  The hot-swap server models support a maximum of eight 2.5-inch or three 3.5-inch hot-swap Serial Attached SCSI (SAS) hard disk drives or hot-swap Serial ATA (SATA) hard disk drives. The simple-swap server models support a maximum of three 3.5-inch simple-swap SATA hard disk drives.

  With the hot-swap feature, you can add, remove, or replace hard disk drives without turning off the server.
- **Light path diagnostics**

  Light path diagnostics provides LEDs to help you diagnose problems. For more information about the light path diagnostics, see “Light path diagnostics panel” on page 15 and the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **PCI adapter capabilities**

  The server has two PCI interface slots (one supports low-profile cards, and one supports half-length, full-height cards). Slot 2 can support PCI Express or PCI-X adapters through an optional PCI riser card. See “Installing an adapter” on page 67 for detailed information.
- **Active Energy Manager**

  The IBM Active Energy Manager solution is an IBM Systems Director plug-in that measures and reports server power consumption as it occurs. This enables you to monitor power consumption in correlation to specific software application programs and hardware configurations. You can obtain the measurement values through the systems-management interface and view them, using IBM Systems Director. For more information, including the required levels of IBM Systems Director and Active Energy Manager, see the IBM Systems Director Information Center at http://publib.boulder.ibm.com/infocenter/director/v6r1x/index.jsp?topic=/director_6.1/fqm0_main.html, or see http://www.ibm.com/servers/systems/management/director/resources/.
- **Redundant connection**

  The addition of the optional Ethernet daughter card provides failover capability to a redundant Ethernet connection with the applicable application installed. If a problem occurs with the primary Ethernet connection and the optional Ethernet daughter card is installed on the server, all Ethernet traffic that is associated with the primary connection is automatically switched to the optional redundant Ethernet daughter card connection. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.
- **Redundant cooling and optional power capabilities**

  The server supports a maximum of two 550-watt or 750-watt hot-swap power supplies and six dual-motor hot-swap fans, which provide redundancy and hot-swap capability for a typical configuration. The redundant cooling by the fans

in the server enables continued operation if one of the fans fails. The server comes with one 550-watt or 750-watt hot-swap power supply and four fans.

You must install the fourth and sixth fans when you install the second microprocessor in the server. You can order the second optional power supply for power redundancy.

Note: You cannot mix 550-watt and 750-watt power supplies in the server.

- **ServeRAID support**

  The ServeRAID adapter provides hardware redundant array of independent disks (RAID) support to create configurations. The standard RAID adapter provides RAID levels 0, 1, and 10. An optional RAID adapter is available for purchase.

- **Systems-management capabilities**

  The server comes with an integrated management module II (IMM2). When the IMM2 is used with the systems-management software that comes with the server, you can manage the functions of the server locally and remotely. The IMM2 also provides system monitoring, event recording, and network alert capability. The system-management connector on the rear of the server is dedicated to the IMM2. The dedicated system-management connector provides additional security by physically separating the management network traffic from the production network. You can use the Setup utility to configure the server to use a dedicated systems-management network or a shared network.

Reliability, availability, and serviceability

Three important computer design features are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored in the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

Your server has the following RAS features:

- 3-year parts and 3-year labor limited warranty for machine type 7914
- Automatic error retry and recovery
- Automatic restart on nonmaskable interrupt (NMI)
- Automatic restart after a power failure
- Backup basic input/output system switching under the control of the Integrated Management Module II (IMM2)
- Built-in monitoring for fan, power, temperature, voltage, and power-supply redundancy
- Cable-presence detection on most connectors
- Chipkill memory protection
- Diagnostic support for ServeRAID and Ethernet adapters
- Error codes and messages
- Error correcting code (ECC) L2 cache and system memory
- Hot-swap cooling fans with speed-sensing capability
- Hot-swap hard disk drives
- Information and light path diagnostics LED panels
- Integrated Management Module II (IMM2)
- Menu-driven setup, system configuration, and redundant array of independent disks (RAID) configuration programs
- Microprocessor built-in self-test (BIST), internal error signal monitoring, configuration checking, and microprocessor and voltage regulator module failure identification through light path diagnostics
- Memory mirrored channel support (memory mirrored channel are mutually exclusive of each other)

- Parity checking on the small computer system interface (SCSI) bus and PCI buses
- Power management: Compliance with Advanced Configuration and Power Interface (ACPI)
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts on memory, SAS/SATA hard disk drives, fans, and power supplies
- Redundant Ethernet capabilities with failover support
- Redundant hot-swap power supplies and redundant hot-swap fans
- Redundant Network Interface Card (NIC) support
- Remind button to temporarily turn off the system-error LED
- Remote system problem-determination support
- ROM-based diagnostics
- ROM checksums
- Serial Presence Detection (SPD) on memory, VPD, power supply, and hard disk drives backplane
- Single-DIMM isolation of excessive correctable error or multi-bit error by the Unified Extensible Firmware Interface (UEFI)
- Standby voltage for system-management features and monitoring
- Startup (boot) from LAN through remote initial program load (RIPL) or dynamic host configuration protocol/boot protocol (DHCP/BOOTP)
- System auto-configuring from the configuration menu
- System-error logging (POST and IMM2)
- Systems-management monitoring through the Inter-Integrated Circuit (IC) protocol bus
- Upgradeable POST, Unified Extensible Firmware Interface (UEFI), diagnostics, IMM2 firmware, and read-only memory (ROM) resident code, locally or over the LAN
- Vital product data (VPD) on microprocessors, system board, power supplies, and SAS/SATA (hot-swap hard disk drive) backplane
- Wake on LAN capability

IBM Systems Director

IBM Systems Director is a platform-management foundation that streamlines the way you manage physical and virtual systems supports multiple operating systems and virtualization technologies in IBM and non-IBM x86 platforms.

Through a single user interface, IBM Systems Director provides consistent views for viewing managed systems, determining how these systems relate to one other, and identifying their statuses, helping to correlate technical resources with business needs. A set of common tasks that are included with IBM Systems Director provides many of the core capabilities that are required for basic management, which means instant out-of-the-box business value. The common tasks include the following:

- Discovery
- Inventory
- Configuration
- System health
- Monitoring
- Updates
- Event notification
- Automation for managed systems

The IBM Systems Director web and command-line interfaces provide a consistent interface that is focused on driving these common tasks and capabilities:

- Discovering, navigating, and visualizing systems on the network with the detailed inventory and relationships to the other network resources
- Notifying users of problems that occur on systems and the ability to isolate the sources of the problems
- Notifying users when systems need updates and distributing and installing updates on a schedule
- Analyzing real-time data for systems and setting critical thresholds that notify the administrator of emerging problems
- Configuring settings of a single system and creating a configuration plan that can apply those settings to multiple systems
- Updating installed plug-ins to add new features and functions to the base capabilities
- Managing the life cycles of virtual resources

For more information about IBM Systems Director, see the IBM Systems Director Information Center at http://publib.boulder.ibm.com/infocenter/director/v6r1x/index.jsp?topic=/director_6.1/fqm0_main.html and the Systems Management web page at http://www.ibm.com/systems/management/, which presents an overview of IBM Systems Management and IBM Systems Director.

The Update*Xpress* System Packs

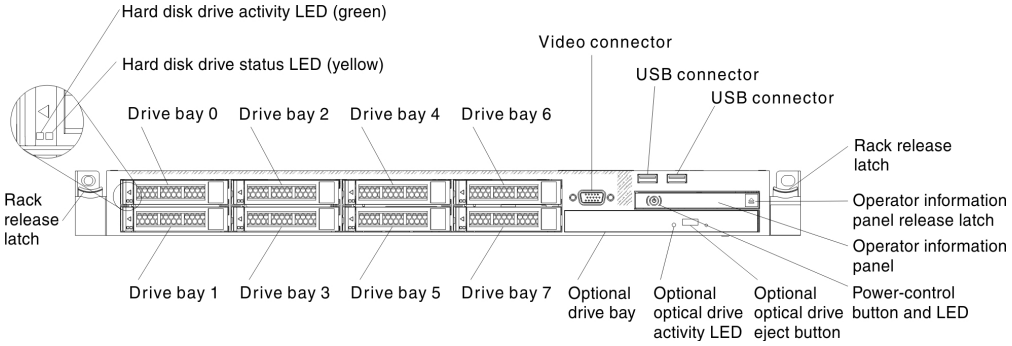
The Update*Xpress* System Pack Installer detects supported and installed device drivers and firmware in the server and installs available updates. For additional information and to download the Update*Xpress* System Pack Installer, go to the ToolsCenter for System x and BladeCenter at, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=SERV-XPRESS&brandind=5000008.

Server controls, LEDs, and power

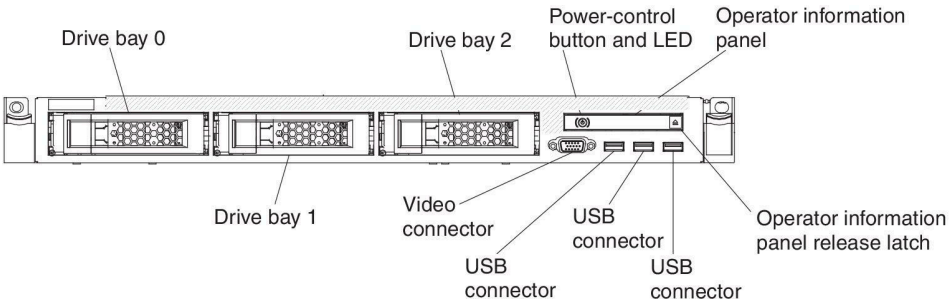
This section describes the controls and light-emitting diodes (LEDs) and how to turn the server on and off. For the locations of other LEDs on the system board, see “System-board LEDs” on page 37.

Front view

The following illustration shows the controls, LEDs, and connectors on the front of the 2.5-inch hard disk drive server model.



The following illustration shows the controls, LEDs, and connectors on the front of the 3.5-inch hard disk drive server model.

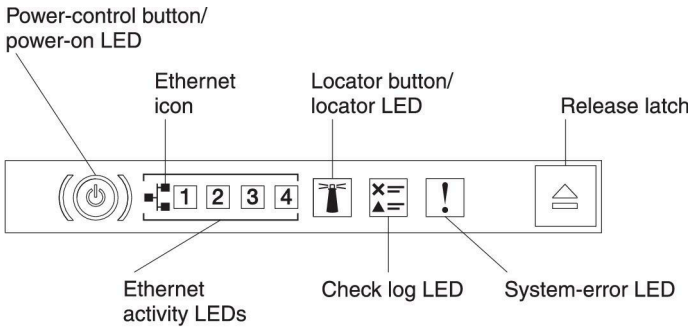


- **Rack release latches:** Press the latches on each front side of the server to remove the server from the rack.
- **Hard disk drive activity LEDs:** This LED is used on hot-swap SAS or SATA hard disk drives. Each hot-swap hard disk drive has an activity LED, and when this LED is flashing, it indicates that the drive is in use.
- **Hard disk drive status LEDs:** This LED is used on hot-swap SAS or SATA hard disk drives. When this LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID controller is installed in the server, when this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.
- **Optional DVD eject button:** Press this button to release a DVD or CD from the optional DVD drive.
- **Optional DVD drive activity LED:** When this LED is lit, it indicates that the optional DVD drive is in use.
- **Operator information panel:** This panel contains controls and LEDs that provide information about the status of the server. For information about the controls and LEDs on the operator information panel, see “Operator information panel.”
- **Operator information panel release latch:** Press the blue release latch to pull out the light path diagnostics panel and view the light path diagnostics LEDs and buttons. See “Light path diagnostics panel” on page 15 and the *Problem Determination and Service Guide* for more information about the light path diagnostics.
- **Video connector:** Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

  Note: The maximum video resolution is 1600 x 1200 at 75 Hz.
- **USB connectors:** Connect a USB device, such as a USB mouse or keyboard to any of these connectors.

Operator information panel

The following illustration shows the controls and LEDs on the operator information panel.



- **Power-control button and power-on LED:** Press this button to turn the server on and off manually. The states of the power-on LED are as follows:

  Off: Power is not present or the power supply, or the LED itself has failed.

  Flashing rapidly (4 times per second): The server is turned off and is not ready to be turned on. The power-control button is disabled. This will last approximately 5 to 10 seconds.

  Flashing slowly (once per second): The server is turned off and is ready to be turned on. You can press the power-control button to turn on the server.

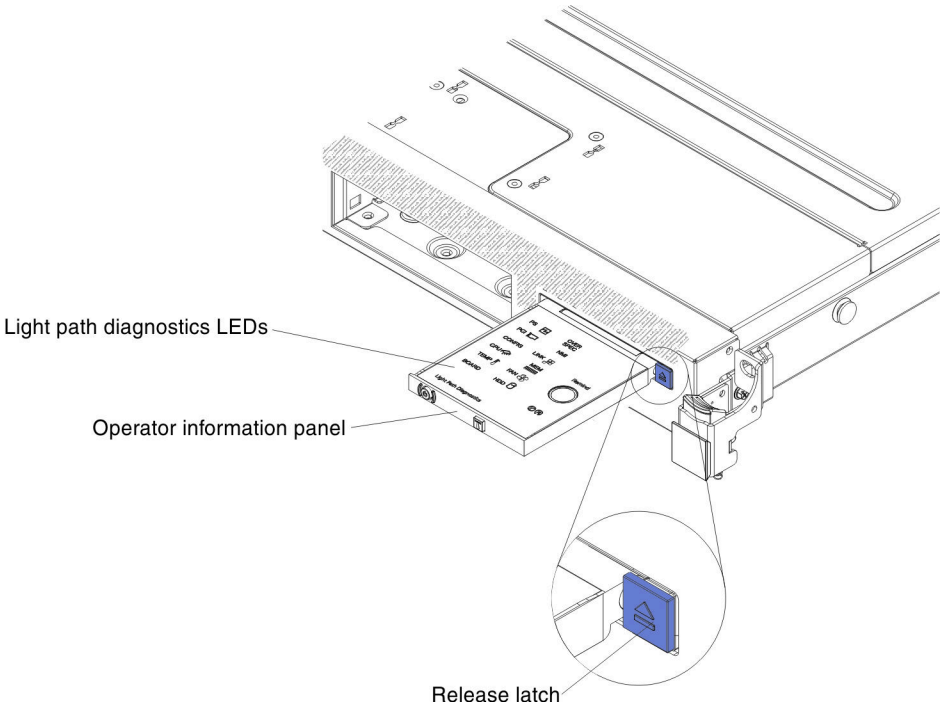
  Lit: The server is turned on.
- **Ethernet activity LEDs:** When any of these LEDs is lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port that corresponds to that LED.
- **System-locator button/LED:** Use this blue LED to visually locate the server among other servers. A system-locator LED is also on the rear of the server. This LED is used as a presence detection button as well. You can use IBM Systems Director or IMM2 web interface to light this LED remotely. This LED is controlled by the IMM2. The locator button is pressed to visually locate the server among the others servers.
- **Check log LED:** When this yellow LED is lit, it indicates that a system error has occurred. Check the error log for additional information. See the *Problem Determination and Service Guide* on the *System x Documentation* CD for more information about error logs.
- **System-error LED:** When this yellow LED is lit, it indicates that a system error has occurred. A system-error LED is also on the rear of the server. An LED on the light path diagnostics panel on the operator information panel or on the system board is also lit to help isolate the error. This LED is controlled by the IMM2.

Light path diagnostics panel

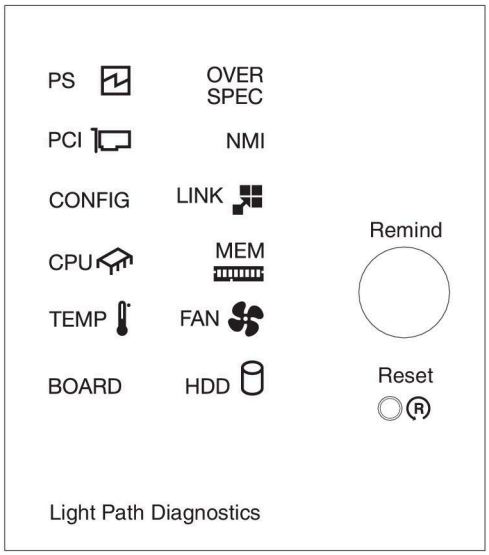
The light path diagnostics panel is located on the top of the operator information panel. For additional information about the LEDs on the light path diagnostics panel, see “Light path diagnostics LEDs” on page 17.

Note: The system service label inside the server cover also provides information about the location of the light path diagnostics LEDs.

To access the light path diagnostics panel, press the blue release latch on the operator information panel. Pull forward on the panel until the hinge of the operator information panel is free of the server chassis. Then pull down on the panel, so that you can view the light path diagnostics panel information.



The following illustration shows the LEDs and controls on the light path diagnostics panel.



- **Remind button:** This button places the system-error LED/check log LED on the front panel into Remind mode. In Remind mode, the system-error LED flashes once every 2 seconds until the problem is corrected, the server is restarted, or a new problem occurs.

  By placing the system-error LED indicator in Remind mode, you acknowledge that you are aware of the last failure but will not take immediate action to correct the problem. The remind function is controlled by the IMM2.

- **Reset button:** Press this button to reset the server and run the power-on self-test (POST). You might have to use a pen or the end of a straightened paper clip to press the button. The Reset button is in the lower-right corner of the light path diagnostics panel.

Light path diagnostics LEDs: The following table describes the LEDs on the light path diagnostics panel and suggested actions to correct the detected problems.

Table 2. Light path diagnostics panel LEDs

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.** • **If an action step is preceded by "(trained technician only)," that step must be performed only by a trained technician.**		
LED	**Description**	**Action**
Check log LED	An error has occurred and cannot be isolated without performing certain procedures.	1. Check the IMM2 system event log and the system-error log for information about the error. 2. Save the log if necessary and clear the log afterwards.
System-error LED	An error has occurred.	1. Check the light path diagnostics LEDs and follow the instructions. 2. Check the IMM2 system event log and the system-error log for information about the error. 3. Save the log if necessary and clear the log afterwards.
PS	When only the PS LED is lit, a power supply has failed.	If the CONFIG LED is not lit, the system might detect a power supply error. Complete the following steps to correct the problem: 1. Check the power-supply with a lit yellow LED (see “AC power-supply LEDs” on page 23). 2. Make sure that the power supplies are seated correctly and plugged in a good AC outlet. 3. Remove one of the power supplies to isolate the failed power supply. 4. Make sure that both power supplies installed in the server are of the same AC input voltage. 5. Replace the failed power supply (see “Installing a hot-swap ac power supply” on page 86).
	PS + CONFIG When both the PS and CONFIG LEDs are lit, the power supply configuration is invalid.	If the PS LED and the CONFIG LED are lit, the system issues an invalid power configuration error. Make sure that both power supplies installed in the server are of the same rating or wattage.
OVER SPEC	The system consumption reaches the power supply over-current protection point or the power supplies are damaged.	1. If the Pwr Rail (1, 2, 3, 4, 5, or 6) error was not detected, complete the following steps: a. Use the IBM Power Configurator utility to determine current system power consumption. For more information and to download the utility, go to http://www-03.ibm.com/systems/bladecenter/resources/powerconfig.html. b. Replace the failed power supply (see “Installing a hot-swap ac power supply” on page 86). 2. If the Pwr Rail (1, 2, 3, 4, 5, or 6) error was also detected, follow actions in the "Power problems" under the Troubleshooting tables and "Solving power problems" in the *Problem Determination and Service Guide*.

Table 2. Light path diagnostics panel LEDs (continued)

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **If an action step is preceded by "(trained technician only)," that step must be performed only by a trained technician.**

LED	Description	Action
PCI	An error has occurred on a PCI card, a PCI bus, or on the system board. An additional LED is lit next to a failing PCI slot.	1. Check the riser-card LEDs, the ServeRAID error LED, and the optional network adapter error LED to identify the component that caused the error. 2. Check the system-error log for information about the error. 3. If you cannot isolate the failing component by using the LEDs and the information in the system-error log, remove one component at a time; and restart the server after each component is removed. 4. Replace the following components, in the order shown, restarting the server each time: • PCI riser cards • ServeRAID adapter • Optional network adapter • (Trained technician only) System board 5. If the failure remains, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-CALL.
NMI	A nonmaskable interrupt has occurred, or the NMI button was pressed.	1. Check the system-error log for information about the error. 2. Restart the server.
CONFIG	CONFIG + PS An invalid power configuration error has occurred.	If the CONFIG LED and the PS LED are lit, the system issues an invalid power configuration error. Make sure that both power supplies installed in the server are of the same rating or wattage.
	CONFIG + CPU A hardware configuration error has occurred.	If the CONFIG LED and the CPU LED are lit, complete the following steps to correct the problem: 1. Check the microprocessors that were just installed to make sure that they are compatible with each other (see “Installing a second microprocessor and heat sink” on page 79 for additional information about microprocessor requirements). 2. (Trained technician only) Replace the incompatible microprocessor. 3. Check the system-error logs for information about the error. Replace any component that is identified in the error log.
	CONFIG + MEM A hardware configuration error has occurred.	If the CONFIG LED and the MEM LED are lit, check the system-event log in the Setup utility or IMM2 error messages (see the *Problem Determination and Service Guide* for more information).
LINK	Reserved.	

Table 2. Light path diagnostics panel LEDs (continued)

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **If an action step is preceded by "(trained technician only)," that step must be performed only by a trained technician.**

LED	Description	Action
CPU	When only the CPU LED is lit, a microprocessor has failed.	If the CONFIG LED is not lit, a microprocessor failure occurs, complete the following steps: 1. (Trained technician only) Make sure that the failing microprocessor and its heat sink, which are indicated by a lit LED on the system board, are installed correctly. See "Installing a second microprocessor and heat sink" on page 79 for information about installation and requirements. 2. (Trained technician only) Replace the failing microprocessor (see "Installing a second microprocessor and heat sink" on page 79). 3. If the failure remains, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-CALL.
	CPU + CONFIG When both the CPU LED and the CONFIG LED are lit, the microprocessor configuration is invalid.	If the CONFIG LED and the CPU LED are lit, the system issues an invalid microprocessor configuration error. Complete the following steps to correct the problem: 1. Check the microprocessors that were just installed to make sure that they are compatible with each other (see "Installing a second microprocessor and heat sink" on page 79 for additional information about microprocessor requirements) and use the Setup utility and select **System Information → System Summary → Processor Details** to verify the microprocessors information. 2. (Trained technician only) Replace the incompatible microprocessor. 3. Check the system-error logs for information about the error. Replace any component that is identified in the error log.
MEM	When only the MEM LED is lit, a memory error has occurred.	**Note:** Each time you install or remove a DIMM, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server. If the CONFIG LED is not lit, the system might detect a memory error. Complete the following steps to correct the problem: 1. Update the server firmware to the latest level (see the *Problem Determination and Service Guide* for more information). 2. Reseat or swap the DIMMs with lit LED. 3. Check the system-event log in the Setup utility or IMM error messages (see the *Problem Determination and Service Guide* for more information). 4. Replace the failing DIMM (see "Installing a memory module" on page 59).
	MEM + CONFIG When both the MEM and CONFIG LEDs are lit, the memory configuration is invalid.	If the MEM LED and the CONFIG LED are lit, check the system-event log in the Setup utility or IMM2 error messages (see the *Problem Determination and Service Guide* for more information).

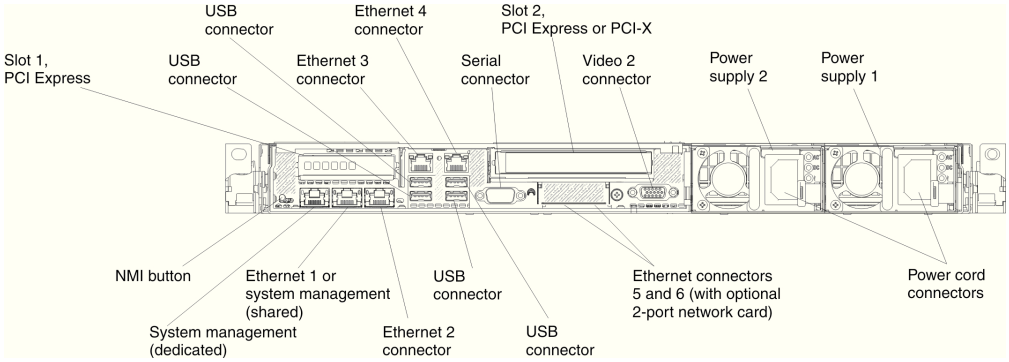
Table 2. Light path diagnostics panel LEDs (continued)

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **If an action step is preceded by "(trained technician only)," that step must be performed only by a trained technician.**

LED	Description	Action
TEMP	The system temperature has exceeded a threshold level. A failing fan can cause the TEMP LED to be lit.	1. Make sure that the heat sink is seated correctly. 2. Determine whether a fan has failed. If it has, replace it. 3. Make sure that the room temperature is not too high. See "Features and specifications" on page 6 for the server temperature information. 4. Make sure that the air vents are not blocked. 5. Make sure that the heat sink, the fan on the adapter, or the optional network adapter is seated correctly. If the fan has failed, replace it. 6. If the failure remains, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-CALL.
FAN	A fan has failed, is operating too slowly, or has been removed. The TEMP LED might also be lit.	1. Reseat the failing fan, which is indicated by a lit LED near the fan connector on the system board. 2. Replace the failing fan (see "Installing a hot-swap fan assembly" on page 93).
BOARD	An error has occurred on the system board.	1. Check the LEDs on the system board to identify the component that caused the error. The BOARD LED can be lit due to any of the following reasons: • Battery • (Trained technician only) System board 2. Check the system-error log for information about the error. 3. Replace the failing component: • Battery • (Trained technician only) System board
HDD	A hard disk drive has failed or is missing.	1. Check the LEDs on the hard disk drives for the drive with a lit status LED and reseat the hard disk drive. 2. Reseat the hard disk drive backplane. 3. For more information, see the "Hard disk drive problems" under the Troubleshooting tables in the *Problem Determination and Service Guide*. 4. If the error remains, replace the following components one at a time, in the order listed, restarting the server after each: a. Replace the hard disk drive. b. Replace the hard disk drive backplane. 5. If the problem remains, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-CALL.

Rear view

The following illustration shows the connectors on the rear of the server.

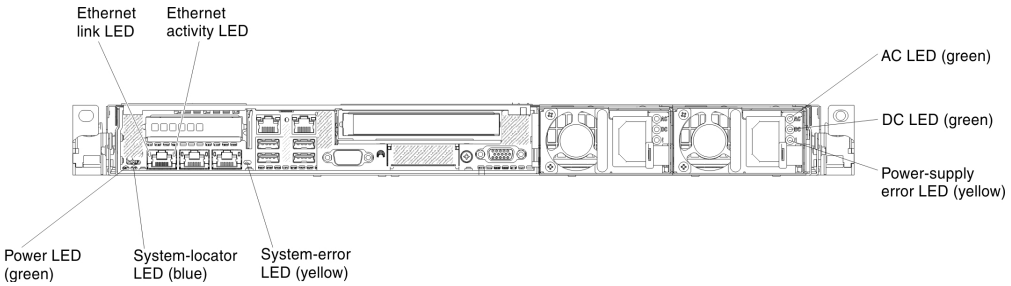


- **NMI button:** Press this button to force a nonmaskable interrupt to the microprocessor. It allows you to blue screen the server and take a memory dump (use this button only when directed by the IBM service support). You might have to use a pen or the end of a straightened paper clip to press the button. The NMI button is in the lower left-hand corner on the rear of the server.
- **PCI slot 1:** Insert a low-profile PCI Express adapter into this slot.
- **PCI slot 2:** Insert a half-length, full-height PCI Express or PCI-X adapter into this slot.
- **Power connector:** Connect the power cord to this connector.

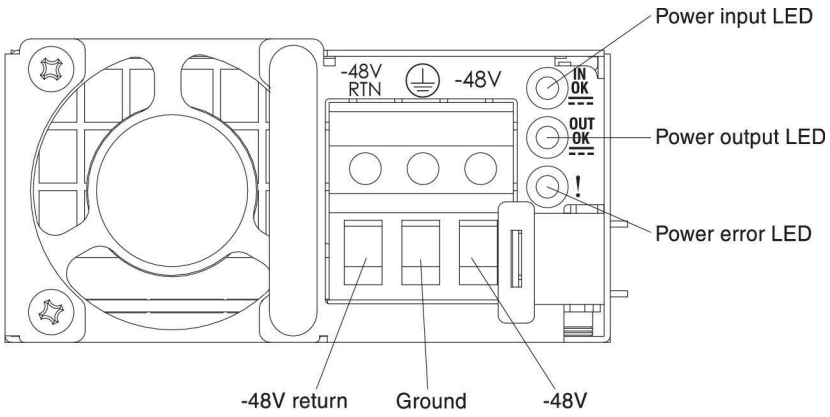
  Note: Power supply 1 is the default/primary power supply. If power supply 1 fails, you must replace it immediately.
- **Video connector:** Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

  Note: The maximum video resolution is 1600 x 1200 at 75 Hz.
- **Serial connector:** Connect a 9-pin serial device to this connector. The serial port is shared with the integrated management module II (IMM2). The IMM2 can take control of the shared serial port to redirect serial traffic, using Serial over LAN (SOL).
- **USB connectors:** Connect a USB device, such as a USB mouse or keyboard to any of these connectors.
- **Systems-management Ethernet connector:** Use this connector to connect the server to a network for full systems-management information control. This connector is used only by the integrated management module (IMM2). A dedicated management network provides additional security by physically separating the management network traffic from the production network. You can use the Setup utility to configure the server to use a dedicated systems management network or a shared network. See Using the Setup utility in the *Problem Determination and Service Guide* for more information.
- **Ethernet connectors:** Use either of these connectors to connect the server to a network. When you enable shared Ethernet for IMM2 in the Setup utility, you can access the IMM2 using either the Ethernet 1 or the system-management Ethernet (default) connector. See Using the Setup utility in the *Problem Determination and Service Guide* for more information.

The following illustration shows the LEDs on the rear of the server.



The following illustration shows the LEDs on a dc power supply.



- **Ethernet activity LEDs:** When these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.
- **Ethernet link LEDs:** When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.
- **AC power LED:** Each hot-swap ac power supply has an ac power LED. When the ac power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, the ac power LED is lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **DC power LED:** Each hot-swap ac power supply has a dc power LED. When the dc power LED is lit, it indicates that the power supply is supplying adequate dc power to the system. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **IN OK power LED:** Each hot-swap dc power supply has an IN OK power LED. When the IN OK power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, both the IN OK and OUT OK power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **OUT OK power LED:** Each hot-swap dc power supply has an OUT OK power LED. When the OUT OK power LED is lit, it indicates that the power supply is supplying adequate dc power to the system. During typical operation, both the IN OK and OUT OK power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.

- **Power-supply error LED:** When the power-supply error LED is lit, it indicates that the power supply has failed.

  Note: Power supply 1 is the default/primary power supply. If power supply 1 fails, you must replace the power supply immediately.
- **Power-on LED:** When this LED is lit and not flashing, it indicates that the server is turned on. The states of the power-on LED are as follows:

  Off: Power is not present, or the power supply or the LED itself has failed.

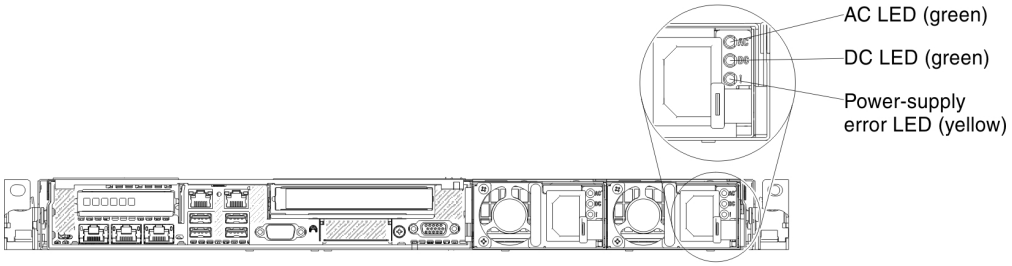
  Flashing rapidly (4 times per second): The server is turned off and is not ready to be turned on. The power-control button is disabled. This will last approximately 5 to 10 seconds.

  Flashing slowly (once per second): The server is turned off and is ready to be turned on. You can press the power-control button to turn on the server.

  Lit: The server is turned on.
- **System-locator LED:** Use this LED to visually locate the server among other servers. You can use IBM Systems Director or IMM2 web interface to light this LED remotely.
- **System-error LED:** When this LED is lit, it indicates that a system error has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.

AC power-supply LEDs

The following illustration shows the location of the power-supply LEDs on the rear of the server. See the *Problem Determination and Service Guide* for additional information about solving power-supply problems.



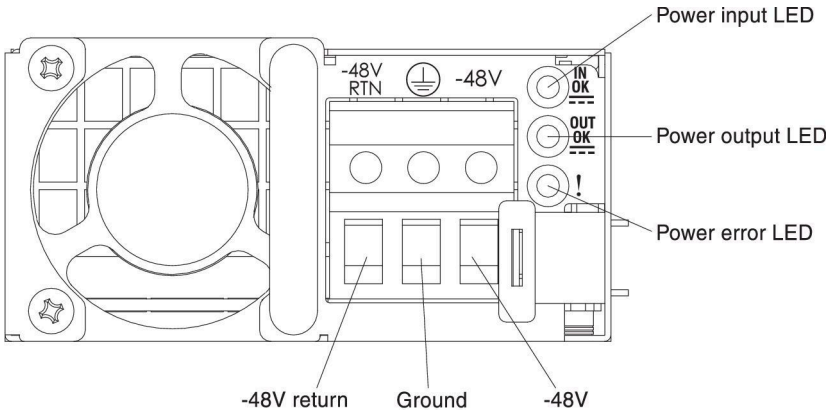
The following table describes the problems that are indicated by various combinations of the power-supply LEDs on an ac power supply and suggested actions to correct the detected problems.

AC power-supply LEDs			Description	Action	Notes
AC	**DC**	**Error (!)**			
On	On	Off	Normal operation.		
Off	Off	Off	No ac power to the server or a problem with the ac power source.	1. Check the ac power to the server. 2. Make sure that the power cord is connected to a functioning power source. 3. Restart the server. If the error remains, check the power-supply LEDs. 4. If the problem remains, replace the power-supply.	This is a normal condition when no ac power is present.

AC power-supply LEDs			Description	Action	Notes
AC	DC	Error (!)			
Off	Off	On	The power supply has failed.	Replace the power supply.	
Off	On	Off	The power supply has failed.	Replace the power supply.	
Off	On	On	The power supply has failed.	Replace the power supply.	
On	Off	Off	Power-supply not fully seated, faulty system board, or the power supply has failed.	1. Reseat the power supply. 2. Follow actions in the "Power problems" under the Troubleshooting tables in the *Problem Determination and Service Guide*. 3. If the OVER SPEC LED on the light path diagnostics is lit, follow the actions in "Light path diagnostics LEDs" on page 17. 4. If the OVER SPEC LED on the light path diagnostics is not lit, check the error LEDs on the system board and the IMM2 error messages. Follow steps in the "Power problems" under the Troubleshooting tables in the *Problem Determination and Service Guide* and "Solving Power problems" in the *Problem Determination and Service Guide* until the problem is solved.	Typically indicates a power-supply is not fully seated.
On	Off	On	The power supply has failed.	Replace the power supply.	
On	On	On	The power supply has failed.	Replace the power supply.	

DC power-supply LEDs

The following illustration shows the locations of the power-supply LEDs on the dc power supply.



The following table describes the problems that are indicated by various combinations of the power-supply LEDs on a dc power supply and suggested actions to correct the detected problems.

DC power-supply LEDs			Description	Action	Notes
IN OK	**OUT OK**	**Error (!)**			
On	On	Off	Normal operation.		
Off	Off	Off	No dc power to the server or a problem with the dc power source.	1. Check the dc power to the server. 2. Make sure that the power cord is connected to a functioning power source. 3. Restart the server. If the error remains, check the power-supply LEDs. 4. If the problem remains, replace the power-supply.	This is a normal condition when no dc power is present.
Off	Off	On	The power supply has failed.	Replace the power supply.	
Off	On	Off	The power supply has failed.	Replace the power supply.	
Off	On	On	The power supply has failed.	Replace the power supply.	

DC power-supply LEDs			Description	Action	Notes
IN OK	OUT OK	Error (!)			
On	Off	Off	Power-supply not fully seated, faulty system board, or the power supply has failed.	1. Reseat the power supply. 2. Follow actions in the “Power problems” under the Troubleshooting tables in the *Problem Determination and Service Guide*. 3. If the OVER SPEC LED on the light path diagnostics is lit, follow the actions in “Light path diagnostics LEDs” on page 17. 4. If the OVER SPEC LED on the light path diagnostics is not lit, check the error LEDs on the system board and the IMM2 error messages. Follow steps in the “Power problems” under the Troubleshooting tables in the *Problem Determination and Service Guide* and “Solving Power problems” in the *Problem Determination and Service Guide* until the problem is solved.	Typically indicates a power-supply is not fully seated.
On	Off	On	The power supply has failed.	Replace the power supply.	
On	On	On	The power supply has failed.	Replace the power supply.	

System pulse LEDs

The following LEDs are on the system board and monitor the system power-on and power-off sequencing and boot progress (see “System-board LEDs” on page 37 for the location of these LEDs):

Table 3. System pulse LEDs

LED	Description	Action
RTMM heartbeat	Power-on and power-off sequencing.	1. If the LED blinks at 1Hz, it is functioning properly and no action is necessary. 2. If the LED is not blinking, (trained technician only) replace the system board.
IMM2 heartbeat	IMM2 heartbeat boot process.	The following steps describe the different stages of the IMM2 heartbeat sequencing process. 1. When this LED is blinking fast (approximately 4Hz), this indicates, that the IMM2 code is in the loading process. 2. When this LED goes off momentarily, this indicates that the IMM2 code has loaded completely. 3. When this LED goes off momentarily and then starts blinking slowing (approximately 1Hz), this indicates that IMM2 is fully operational. You can now press the power-control button to power-on the server. 4. If this LED does not blink within 30 seconds of connecting a power source to the server, (trained technician only) Replace the system board.

Server power features

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic except for the integrated management module II (IMM2) is shut down; however, the server can respond to requests from IMM2, such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to an ac power source but is not turned on.

Turning on the server

Approximately 5 seconds after the server is connected to power, one or more fans might start running to provide cooling while the server is connected to power and the power-on button LED will blink quickly. Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active (the power-on LED will blink slowly), and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server by pressing the power-control button.

The server can also be turned on in any of the following ways:

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature can turn on the server.

Notes:

1. When 4 GB or more of memory (physical or logical) is installed, some memory is reserved for various system resources and is unavailable to the operating

system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

2. Ethernet 1 connector supports Wake on LAN feature.
3. When you turn on the server with the graphical adapters installed, the IBM logo displays on the screen after approximately 3 minutes. This is normal operation while the system loads.

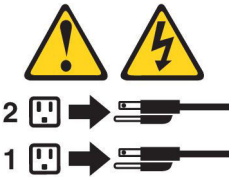
Turning off the server

When you turn off the server and leave it connected to power, the server can respond to requests to the service processor, such as a remote request to turn on the server. While the server remains connected to power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- The server can be turned off by Wake on LAN feature with the following limitation:

  Note: When you install any PCI adapter, the power cords must be disconnected from the power source before you remove the PCI Express riser-card assembly and the PCI-X riser-card assembly. Otherwise, the Wake on LAN feature might not work.

- The integrated management module II (IMM2) can turn off the server as an automatic response to a critical system failure.

Chapter 2. Installing optional devices

This chapter provides detailed instructions for installing optional hardware devices in the server.

Instructions for IBM Business Partners

In addition to the instructions in this chapter for installing optional hardware devices, updating firmware and device drivers, and completing the installation, IBM Business Partners must also complete the following steps:

1. After you have confirmed that the server starts correctly and recognizes the newly installed devices and that no error LEDs are lit, run the Dynamic System Analysis (DSA) stress tests. For information about using DSA, see the *Problem Determination and Service Guide*.
2. Shut down and restart the server multiple times to ensure that the server is correctly configured and functions correctly with the newly installed devices.
3. Save the DSA log as a file and send it to IBM. For information about transferring data and logs, see http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp?topic=/dsa/dsa_main.html.
4. To ship the server, repackage it in the original undamaged packing material and observe IBM procedures for shipping.

Support information for IBM Business Partners is available at http://www.ibm.com/partnerworld/.

How to send DSA data to IBM

Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/terms.html.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

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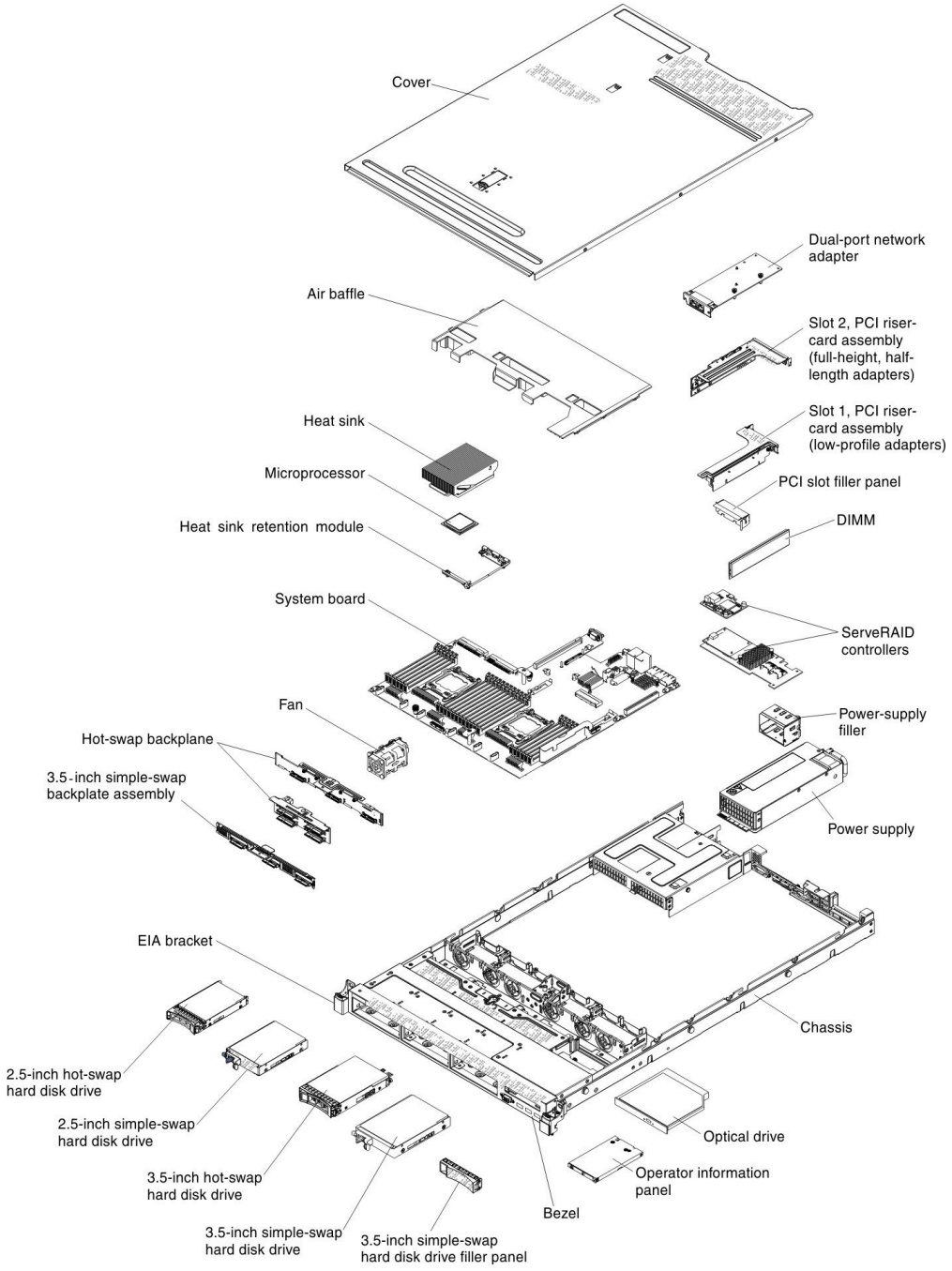
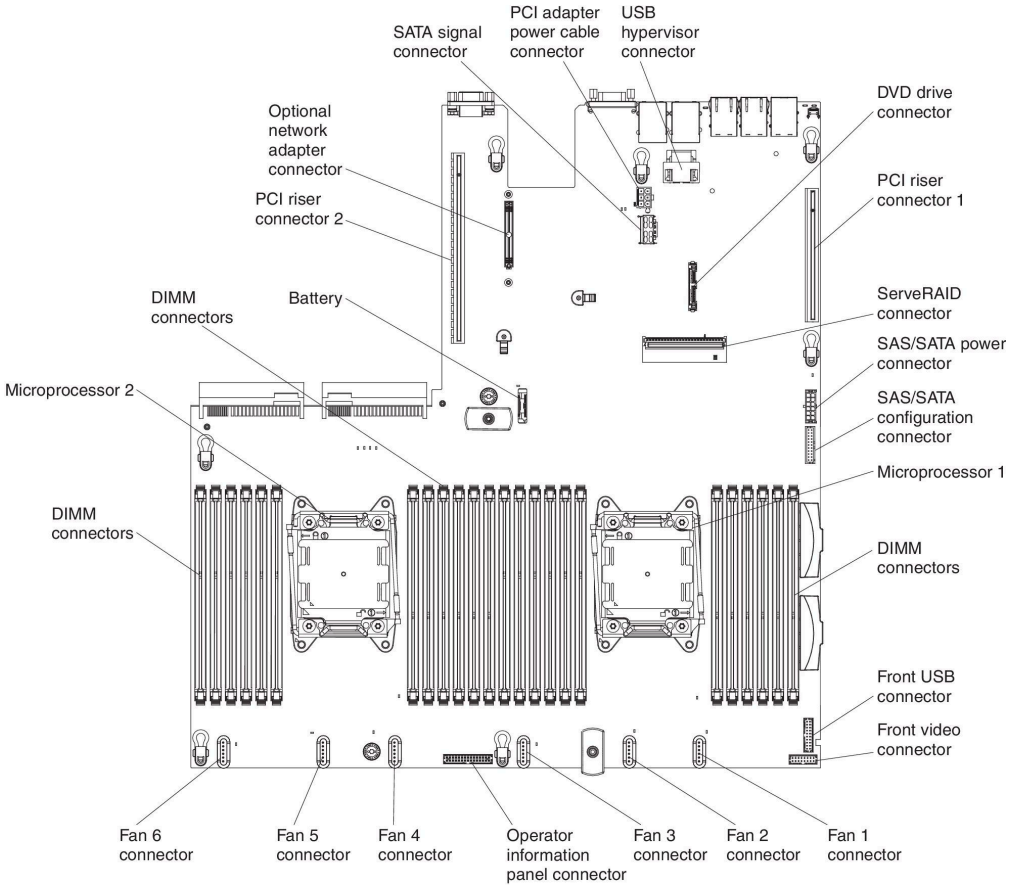
Server components

The following illustration shows the major components in the server. The illustrations in this document might differ slightly from your hardware.



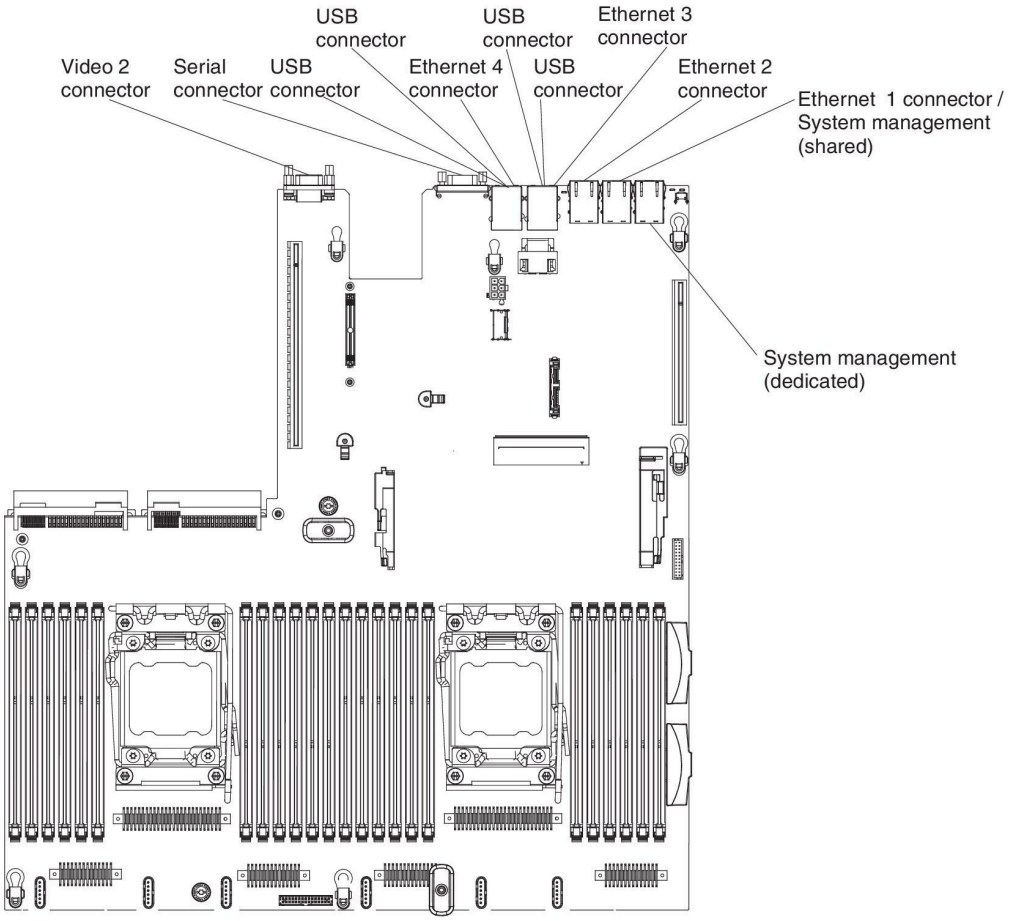
System-board internal connectors

The following illustration shows the internal connectors on the system board.



System-board external connectors

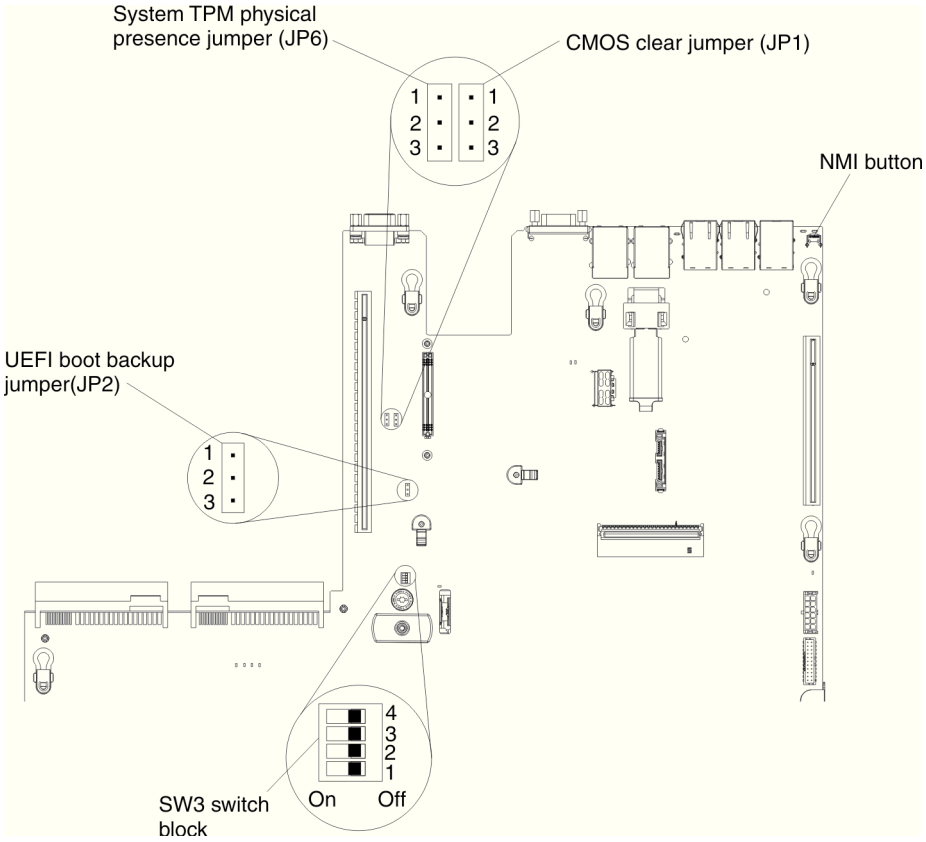
The following illustration shows the external connectors on the system board.



System-board switches and jumpers

The following illustration shows the location and description of the switches and jumpers.

Note: If there is a clear protective sticker on the top of the switch blocks, you must remove and discard it to access the switches.



The following table describes the jumpers on the system board.

Table 4. System board jumpers

Jumper number	Jumper name	Jumper setting
JP1	CMOS clear jumper	• Pins 1 and 2: Normal (default). • Pins 2 and 3: Clears the real-time clock (RTC) registry.
JP2	UEFI boot backup jumper	• Pins 1 and 2: Normal (default). Loads the primary server firmware ROM page. • Pins 2 and 3: Loads the secondary (backup) server firmware ROM page.
JP6	System TPM physical presence jumper	• Pins 1 and 2: Normal (default). • Pins 2 and 3: Indicates a physical presence to the system TPM.
Note: Changing the position of the UEFI boot recovery jumper from pins 1 and 2 to pins 2 and 3 before the server is turned on alters which flash ROM page is loaded. Do not change the jumper pin position after the server is turned on. This can cause an unpredictable problem.		

The following table describes the functions of the SW3 switch block on the system board.

Table 5. System board SW3 switch block definition

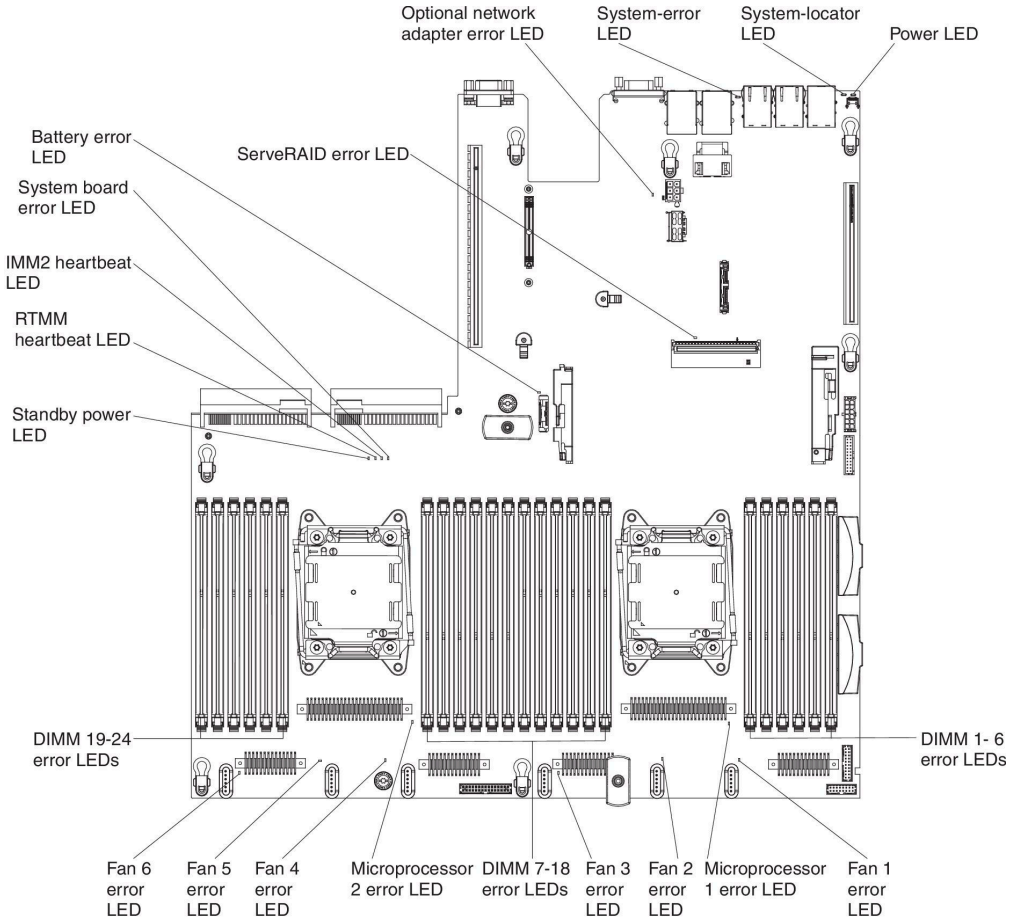
Switch number	Default position	Description
1	Off	Reserved.
2	Off	Reserved.
3	Off	Reserved.
4	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Setup utility so that you can change or delete the power-on password. You do not have to move the switch back to the default position after the power-on password in overridden. Changing the position of this switch does not affect the administrator password check if an administrator password is set. See “Passwords” on page 113 for additional information about passwords.

Important:

1. Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. Review the information in vii, “Installation guidelines” on page 38, “Handling static-sensitive devices” on page 40, and “Turning off the server” on page 28.
2. Any system-board switch or jumper block that is not shown in the illustrations in this document are reserved.

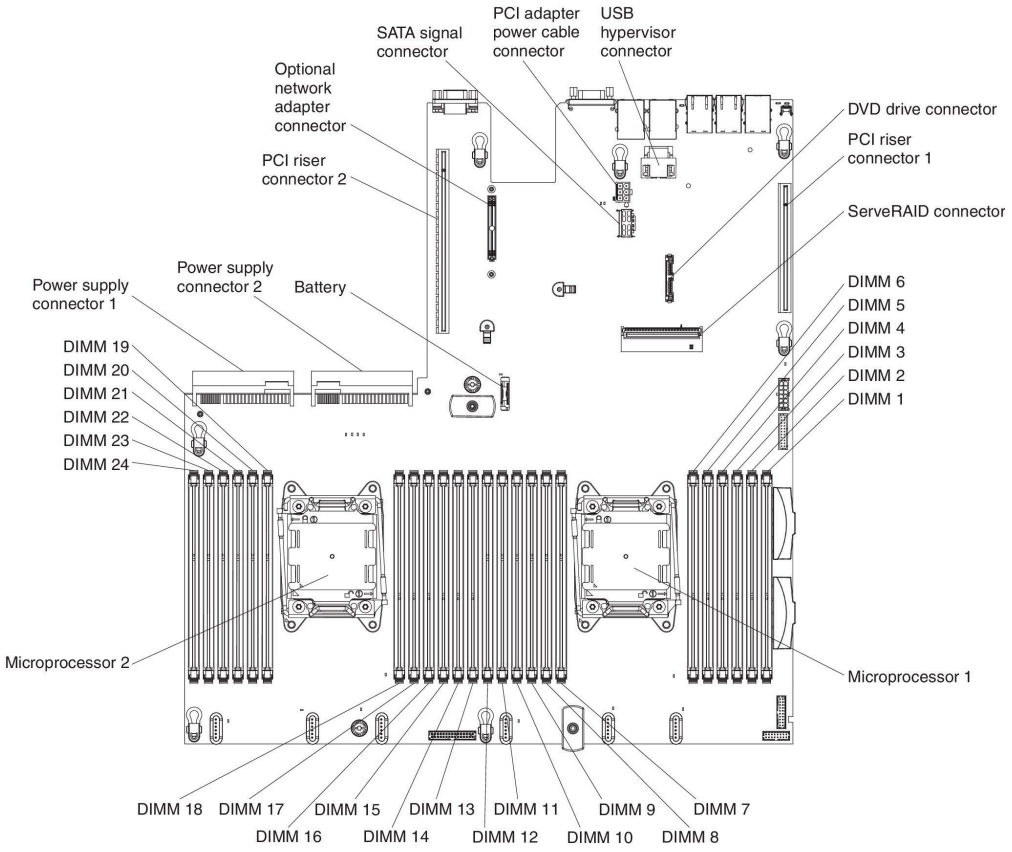
System-board LEDs

The following illustration shows the light-emitting diodes (LEDs) on the system board.



System-board optional devices connectors

The following illustration shows the connectors on the system board for user-installable options.



Installation guidelines

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the system to halt, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when removing or installing a hot-swap device.

Before you install optional devices, read the following information:

- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Read the safety information that begins on page vii and the guidelines in "Working inside the server with the power on" on page 40, and "Handling static-sensitive devices" on page 40. This information will help you work safely.
- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, go to http://www.ibm.com/support/fixcentral/.

Important: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

For additional information about tools for updating, managing, and deploying firmware, see the ToolsCenter for System x and BladeCenter at http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp.

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for diagnostic information.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the server cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T8 torx screwdriver available.
- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap fans, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

System reliability guidelines

To help ensure proper system cooling and system reliability, make sure that the following requirements are met:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before you turn on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap fan within 30 seconds of removal.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffle installed. Operating the server without the air baffle might cause the microprocessor to overheat.
- Microprocessor socket 2 always contains either a socket cover or a microprocessor and heat sink.
- You have installed the fourth and sixth fans when you installed the second microprocessor option.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.

The server supports hot-plug, hot-add, and hot-swap devices and is designed to operate safely while it is turned on and the server cover is removed. Follow these guidelines when you work inside a server that is turned on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

Attention: Static electricity can damage the server and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

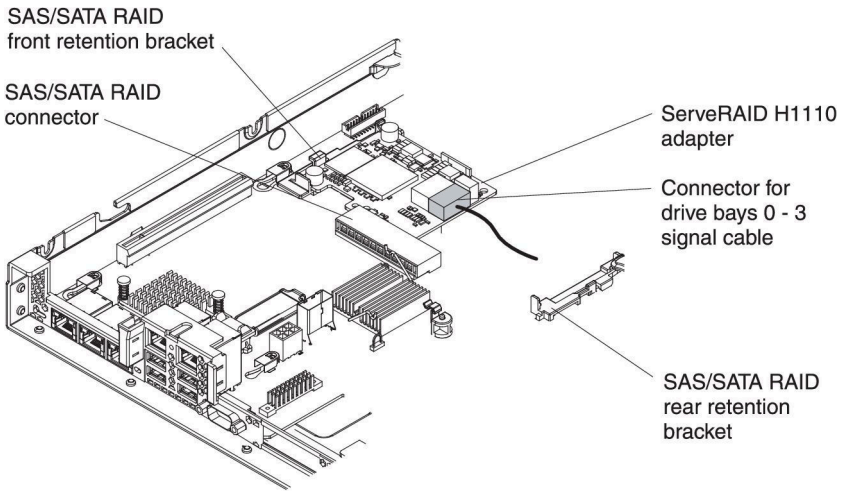
Internal cable routing and connectors

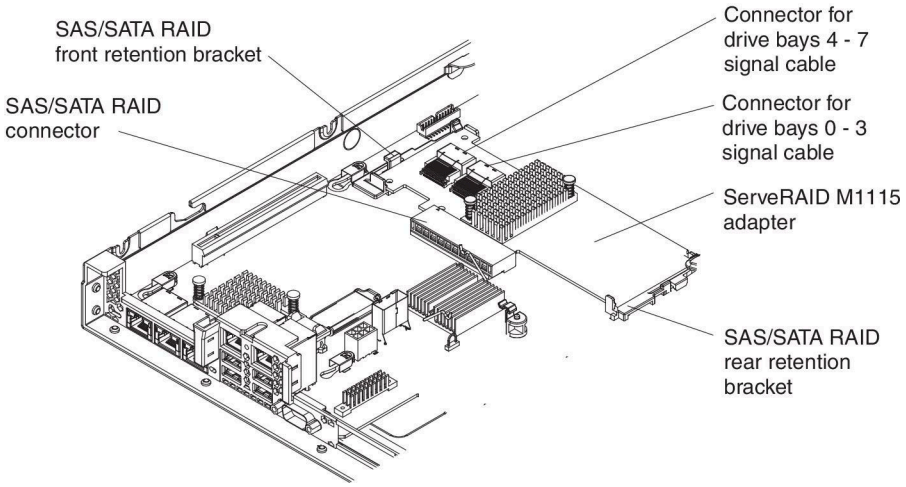
Hard disk drive cable connection

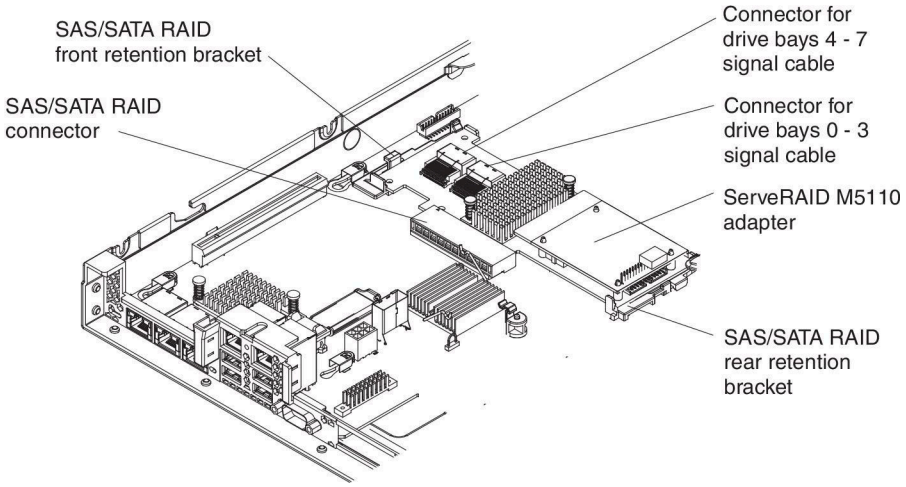
The following illustrations show the internal routing and connectors for the SAS/SATA signal cables.

Notes:

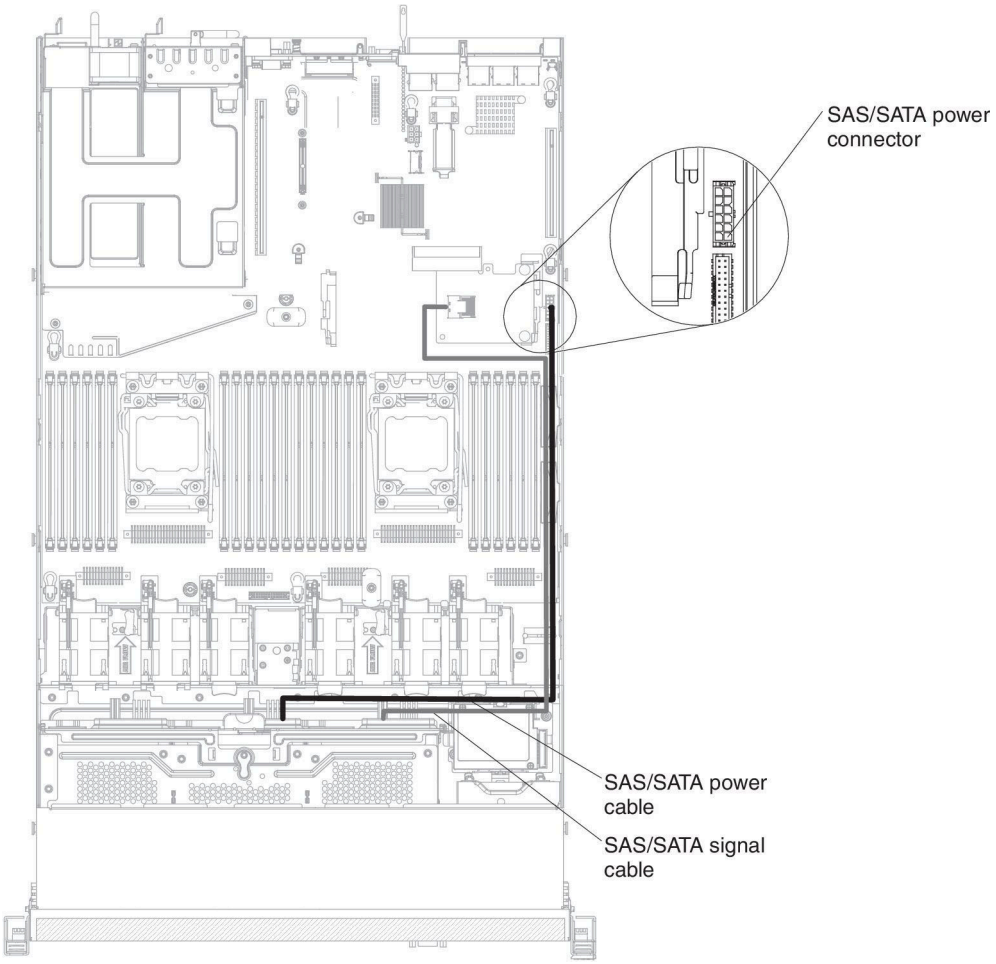
1. To connect the SAS/SATA signal cables, make sure that you first connect the signal cable, and then the power cable and configuration cable.
2. To disconnect the SAS/SATA signal cables, make sure that you first disconnect the power cable, and then the signal cable and configuration cable.



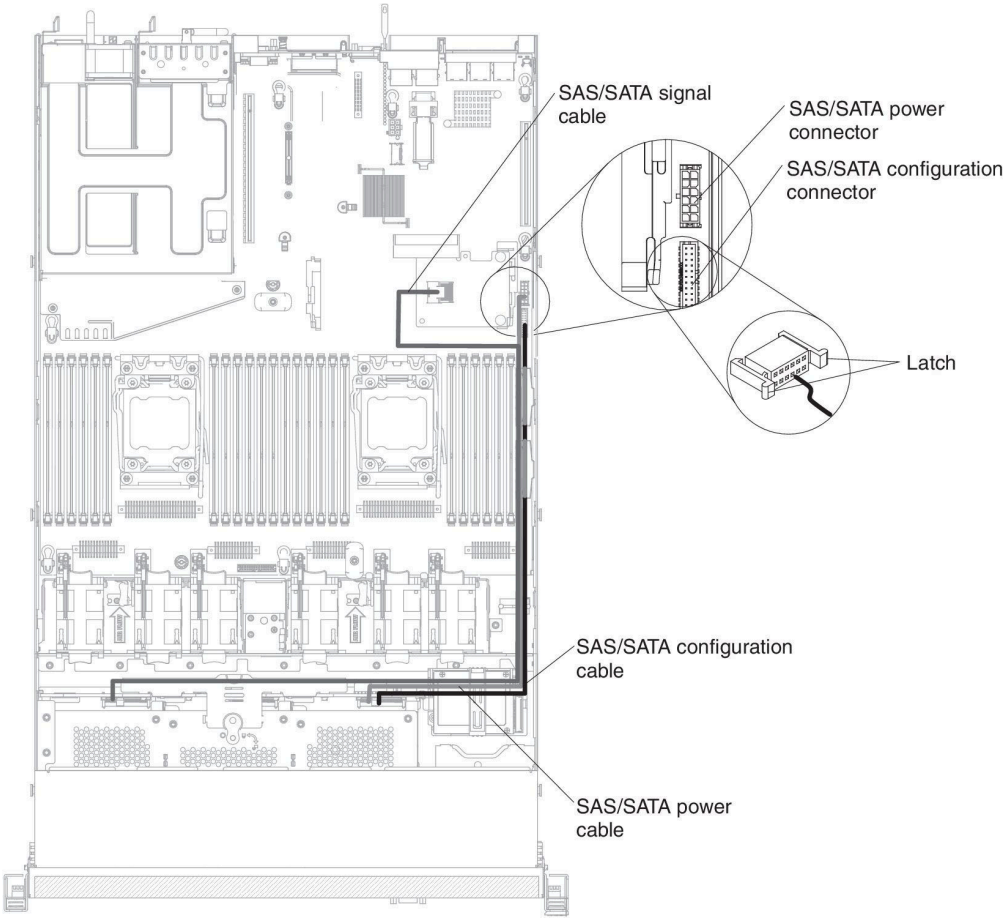

SAS/SATA RAID
front retention bracket
SAS/SATA RAID
connector
Connector for
drive bays 4 - 7
signal cable
Connector for
drive bays 0 - 3
signal cable
ServeRAID M1115
adapter
SAS/SATA RAID
rear retention
bracket


SAS/SATA RAID
front retention bracket
SAS/SATA RAID
connector
Connector for
drive bays 4 - 7
signal cable
Connector for
drive bays 0 - 3
signal cable
ServeRAID M5110
adapter
SAS/SATA RAID
rear retention
bracket

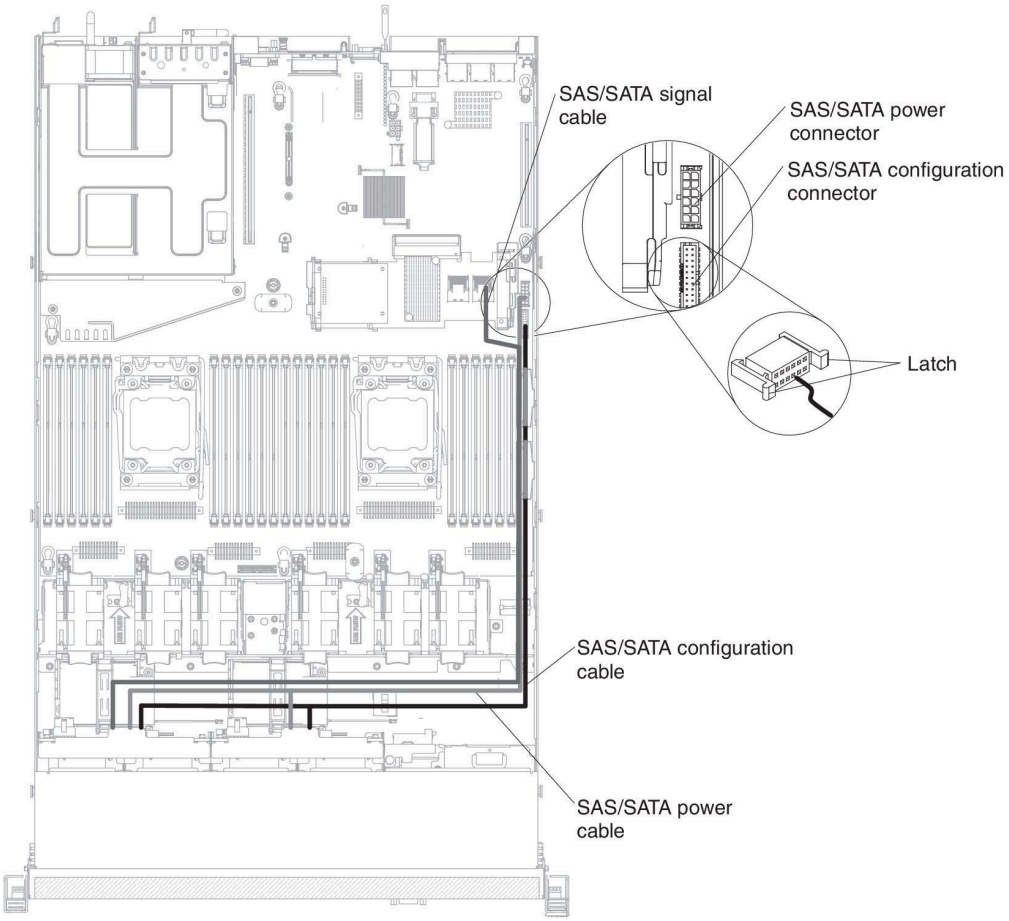
The following illustration shows the internal routing and connectors for the 3.5-inch simple-swap hard disk drives SATA signal and power cables.



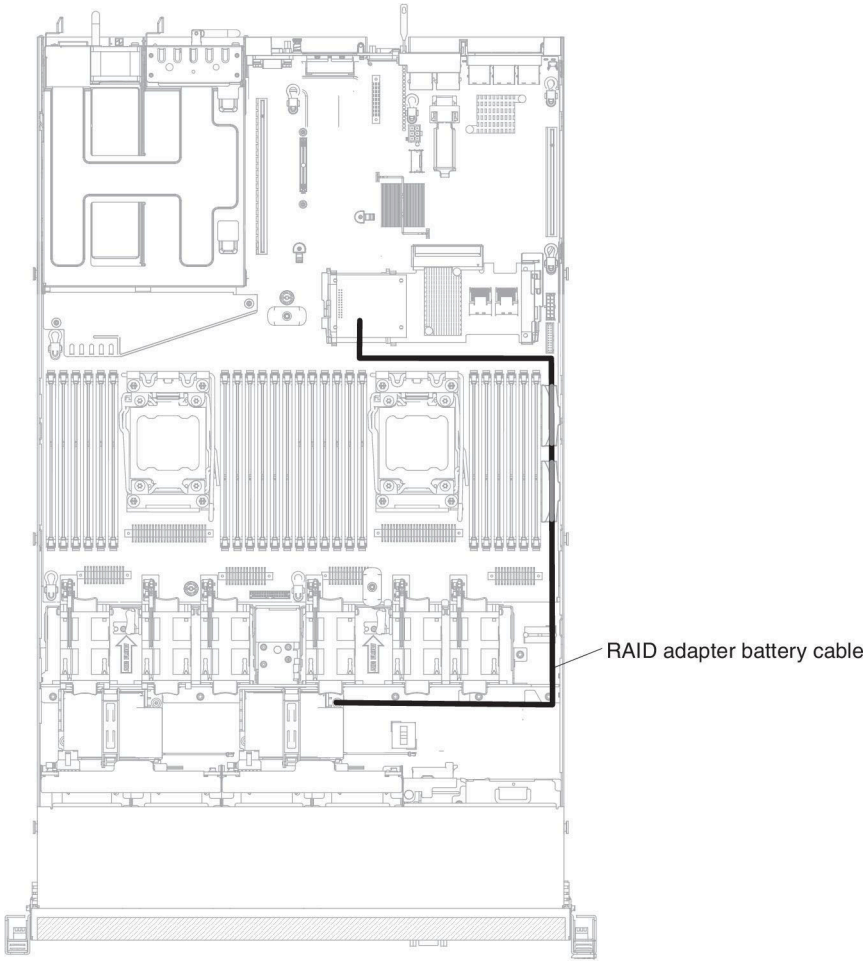
The following illustration shows the internal routing and connectors for the 3.5-inch hot-swap hard disk drives SAS/SATA signal, power and configuration cables with the SAS/SATA adapter installed.



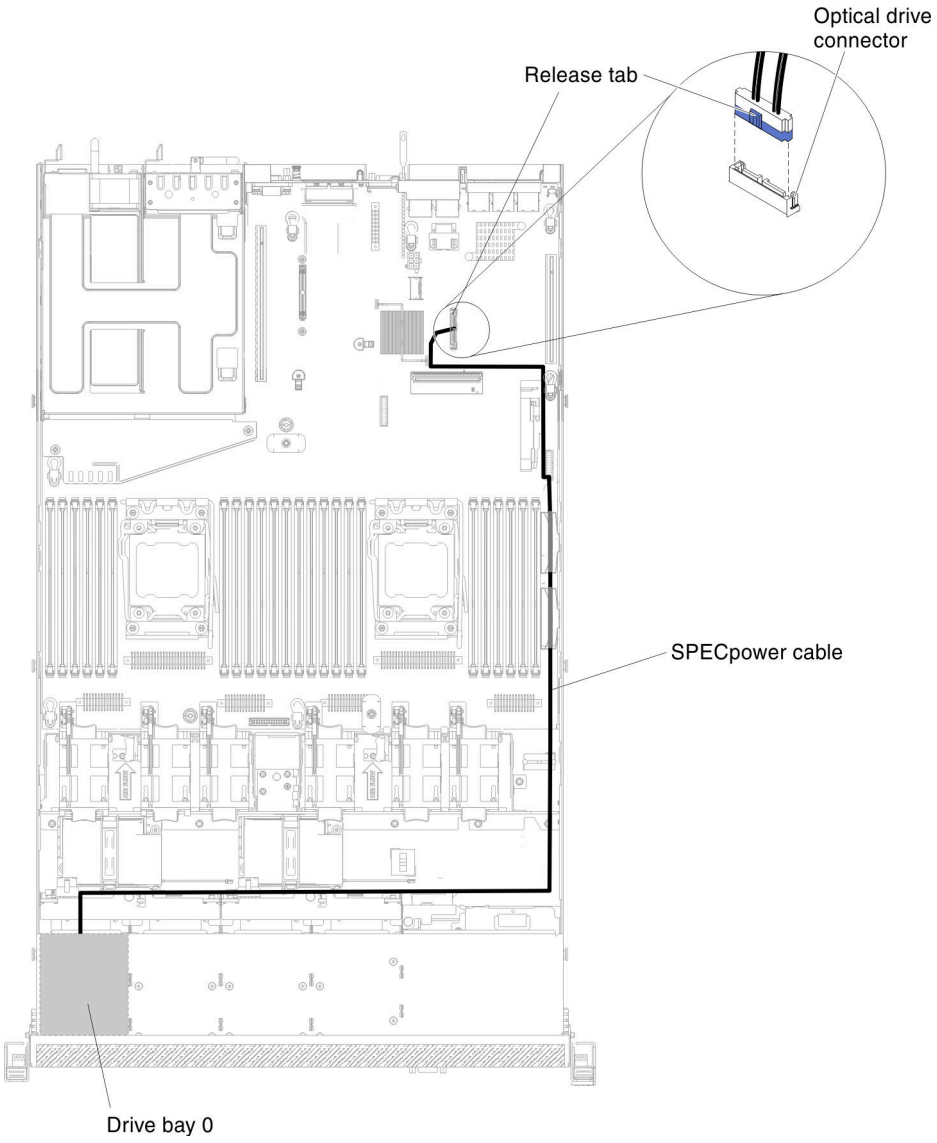
The following illustration shows the internal routing and connectors for the SAS/SATA signal, power and configuration cables with the SAS/SATA adapter installed.



The following illustration shows the internal routing and connectors for the RAID battery cables with the SAS/SATA adapter installed.



The following illustration shows the internal routing and connectors for the server models with one 2.5-inch simple-swap hard disk drives.

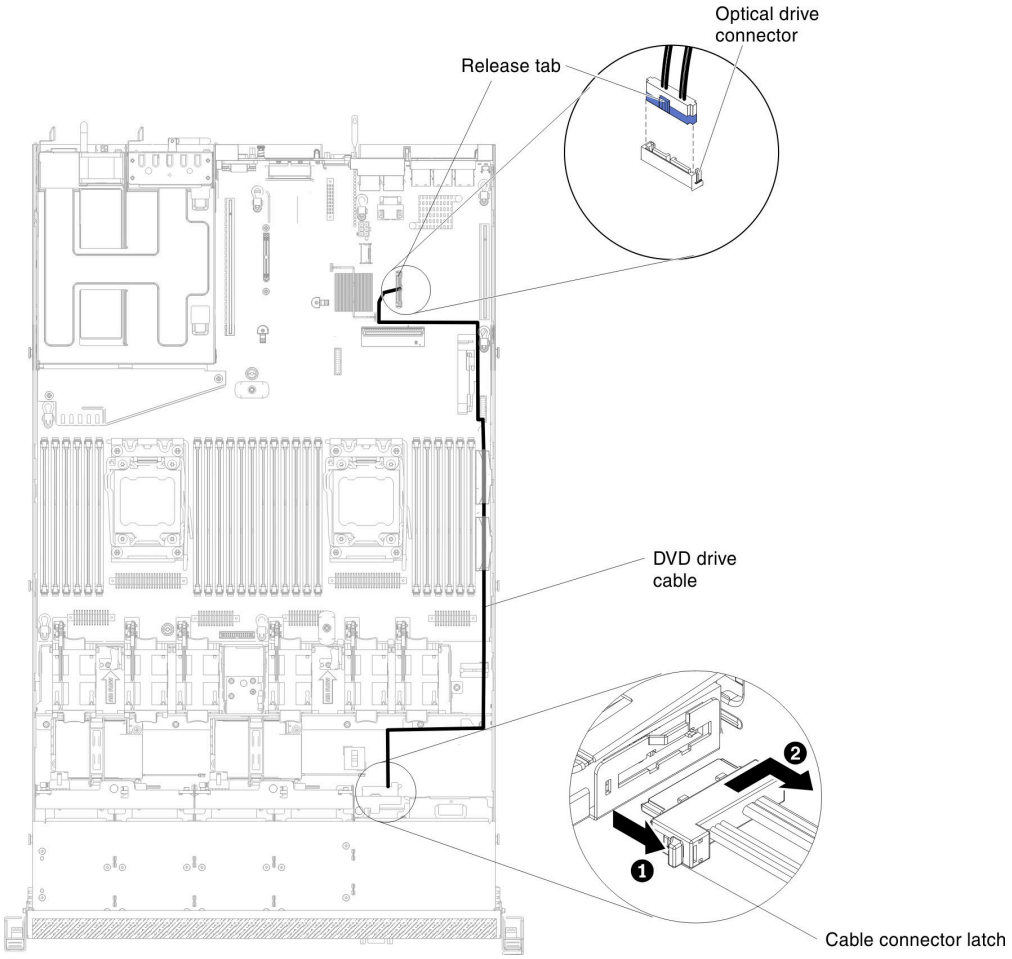


DVD drive cable connection

The following illustration shows the internal routing and connector for the DVD drive cable.

Notes:

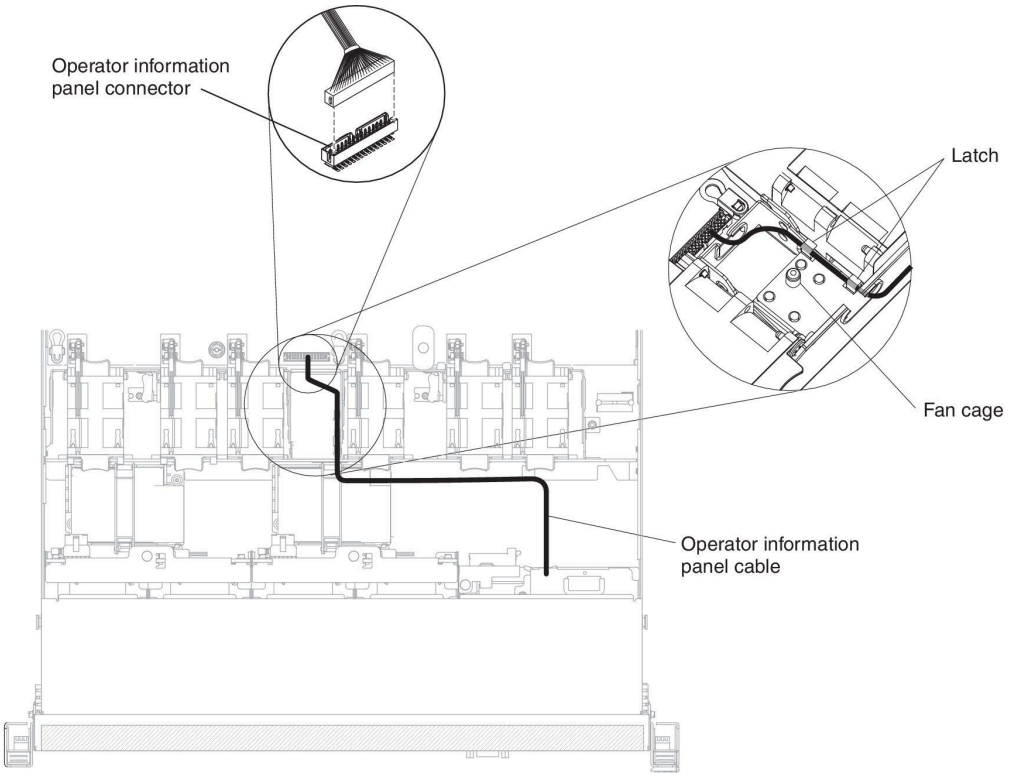
1. To disconnect the optional optical drive cable, you must first press the connector release tab, and then disconnect the cable from the connector on the system board. Do not disconnect the cable by using excessive force.
2. Follow the optical drive cable routing as the illustration shows. Make sure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.



Operator information panel cable connection

The following illustration shows the internal routing and connector for the operator information panel cable. The following notes describe additional information you must consider when you install or remove the operator information panel cable:

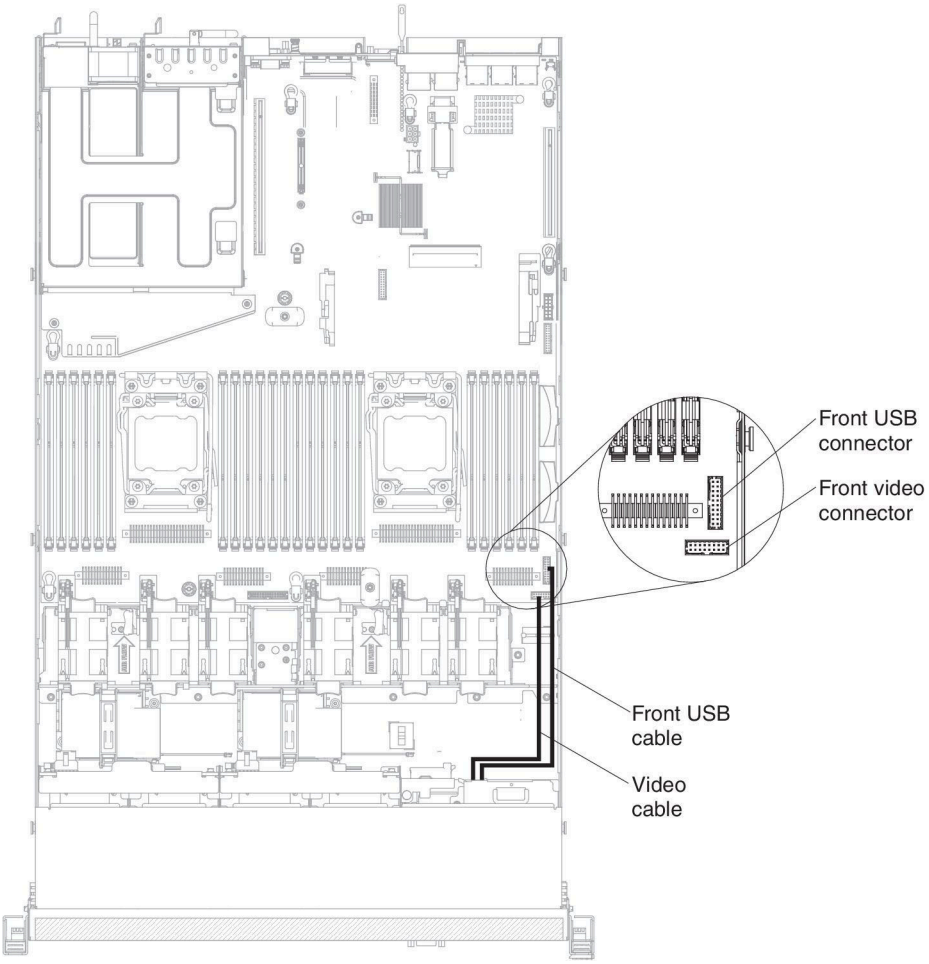
- To remove the operator information panel cable, slightly press the cable toward the fan cage; then, pull to remove the cable from the connector on the system board. Pulling the cable out of the connector by excessive force might cause damage to the cable or connector.
- To connect the operator information panel cable on the system board, press evenly on the cable. Pressing on one side of the cable might cause damage to the cable or connector.



USB and video cable connection

The following illustration shows the internal routing and connectors for the front USB and video cables. The following notes describe additional information you must consider when you install or remove the front USB and video cables:

- To remove the front USB and video cables, slightly press the cables toward the chassis; then, pull to remove the cables from the connectors on the system board. Pulling the cable out of the connector by excessive force might cause damage to the cable or connector.
- To connect the front USB and video cables on the system board, press evenly on the cables. Pressing on one side of the cable might cause damage to the cable or connector.



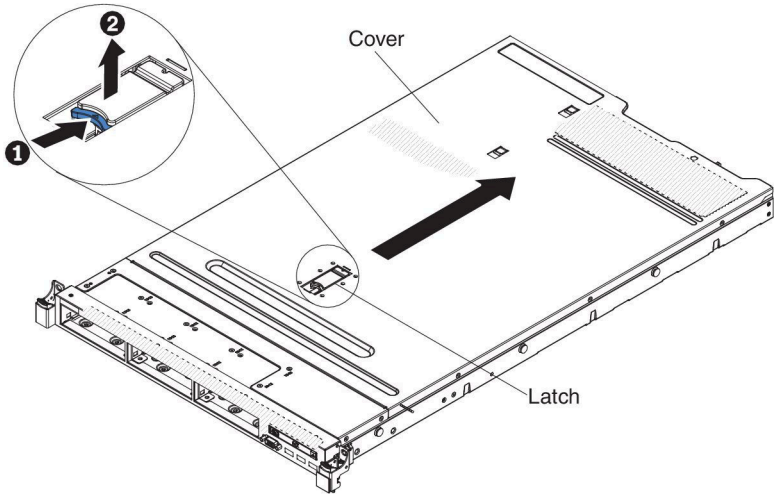
Removing the cover

Important: Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Problem Determination and Service Guide* for diagnostic information.

To remove the server cover, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.

   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit, including the LEDs that are lit on the operation information panel, on the light path diagnostics panel, and LEDs inside the server on the system board; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.
3. If the server has been installed in a rack, slide the server out from the rack enclosure.



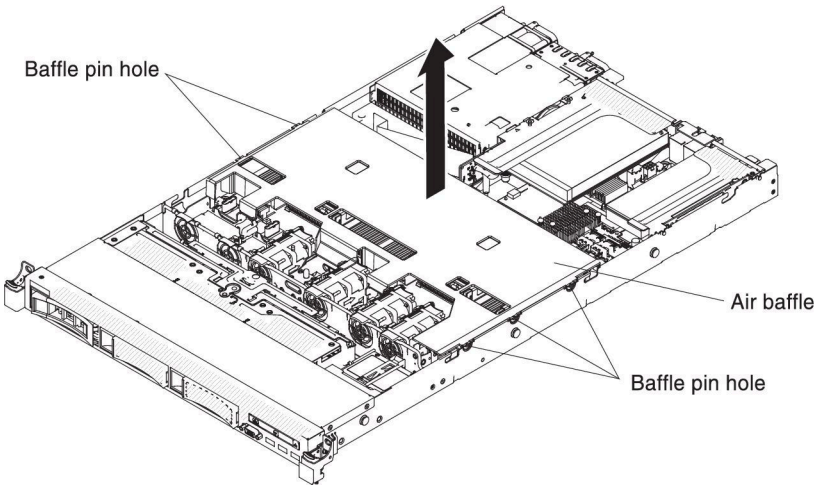
4. Pull up firmly on the blue latch on the top (in the center of the front of the server) of the cover and slide the cover toward the rear of the server until the cover has disengaged from the chassis.
5. Lift the server cover off the server and set it aside.

Attention: For proper cooling and airflow, replace the server cover before you turn on the server.

Removing the air baffle

To remove the air baffle, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.
3. Remove the cover (see “Removing the cover” on page 50).
4. Grasp the air baffle, disengage pins from pin holes; then, lift the air baffle up.



5. Remove the air baffle from the server and set it aside.

   Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with the air baffle removed might damage server components.

Installing drives

The following notes describe the type of drives that the server supports and other information that you must consider when you install a drive.

- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Locate the documentation that comes with the drive and follow those instructions in addition to the instructions in this chapter.
- Make sure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
- Select the bay in which you want to install the drive.
- Check the instructions that come with the drive to determine whether you have to set any switches or jumpers on the drive. If you are installing a SAS or SATA hard disk drive, be sure to set the SAS or SATA ID for that device.
- The hot-swap server models support up to eight 2.5-inch or three 3.5-inch hot-swap SAS or SATA hard disk drives.
- The simple-swap server models support up to three 3.5-inch simple-swap SATA hard disk drives.
- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all bays and PCI and PCI Express slots covered or occupied. When you install a drive, PCI, or PCI Express adapter, save the EMC shield and filler panel from the bay or PCI adapter or PCI Express adapter slot cover in the event that you later remove the device.

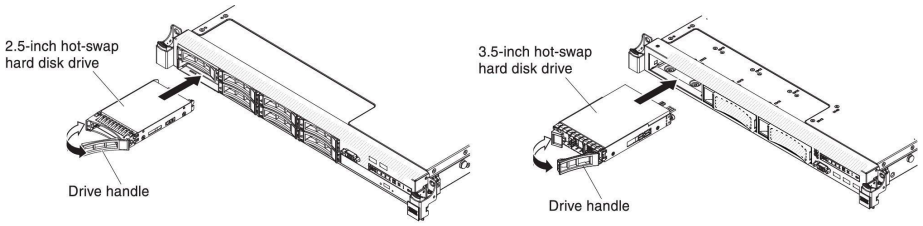
Installing a hot-swap hard disk drive

To install a hot-swap SAS or SATA hard disk drive, complete the following steps.

Note: If you have only one hard disk drive, you must install it in the upper-left bay.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.

2. Remove the filler panel from the empty drive bay. Keep the filler panel in a safe place.
3. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
4. Install the hard disk drive in the drive bay:
   a. Make sure that the tray handle is in the open (unlocked) position.
   b. Align the drive with the guide rails in the bay.



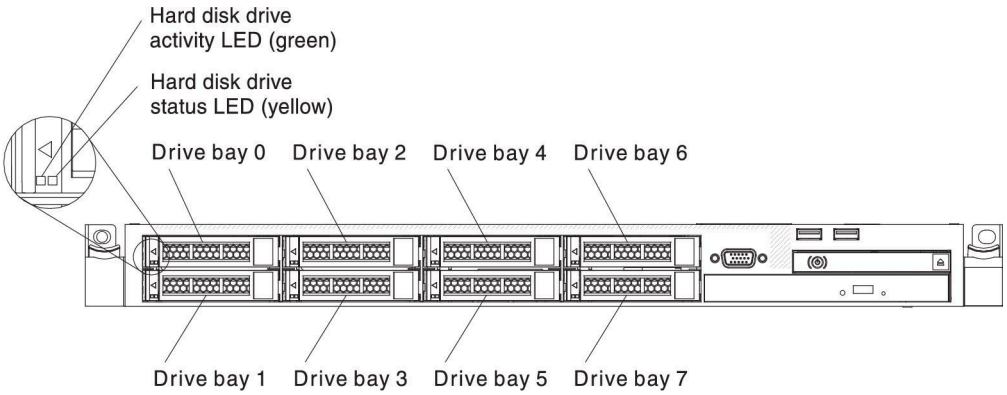
   c. Gently push the drive into the bay until the drive stops.
   d. Rotate the tray handle to the closed (locked) position.
   e. Check the hard disk drive status LED to verify that the hard disk drive is operating correctly. If the yellow hard disk drive status LED of a drive is lit continuously, that drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.

      Note: If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.
5. If you are installing additional hot-swap hard disk drives, do so now.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

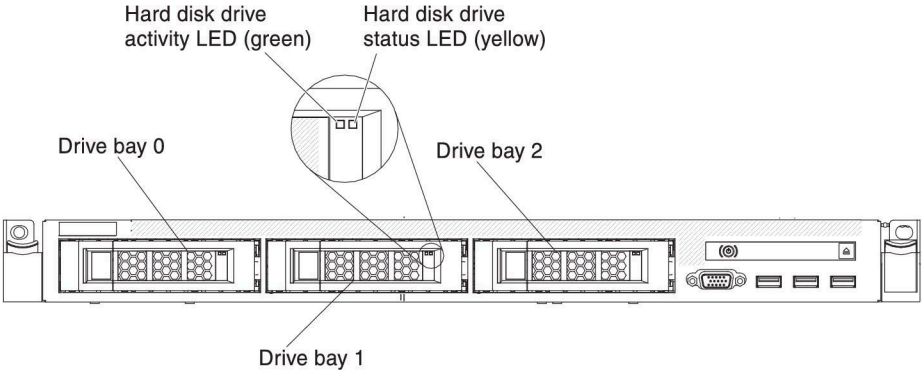
IDs for 2.5-inch hot-swap hard disk drives

The hot-swap-drive ID that is assigned to each drive is printed on the front of the server. The following illustration shows the location of the IDs of the hard disk drives. The ID numbers and the drive bay numbers are the same.



IDs for 3.5-inch hot-swap hard disk drives

The hot-swap-drive ID that is assigned to each drive is printed on the front of the server. The following illustration shows the location of the IDs of the hard disk drives. The ID numbers and the drive bay numbers are the same.



Installing a simple-swap hard disk drive

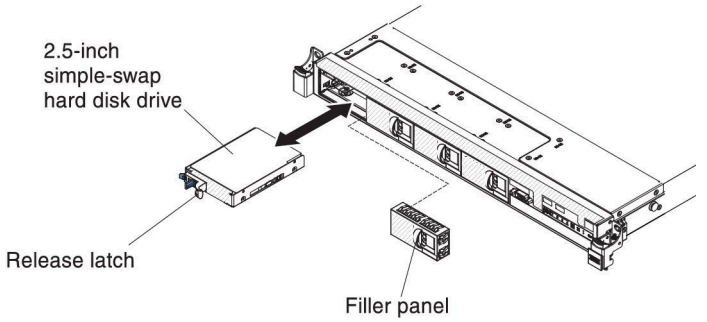
You must turn off the server before installing simple-swap drives in the server. Before you install a simple-swap SATA hard disk drive, read the following information.

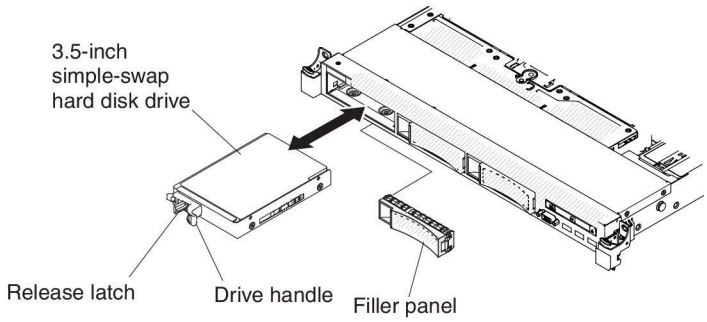
- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.
- Make sure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
- Select the bay in which you want to install the drive.
- Check the instructions that come with the drive to determine whether you have to set any switches or jumpers on the drive. If you are installing a SATA device, be sure to set the SATA ID for that device.
- You can install up to three 3.5-inch simple-swap SATA hard disk drives in the server. Do not install hot-swap drives into a simple-swap server model, it is not supported.
- You can install one 2.5-inch simple-swap SATA hard disk drives in bay 0 in the server. Do not install hot-swap drives into a simple-swap server model, it is not supported.
- The simple-swap server models are available only in non-RAID configurations.
- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all bays and PCI and PCI Express slots covered or occupied. When you install a drive, PCI, or PCI Express adapter, save the EMC shield and filler panel from the bay or PCI or PCI Express adapter slot cover in the event that you later remove the device.

To install a simple-swap SATA hard disk drive, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.
3. Remove the filler panel from the empty drive bay.

4. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
5. Install the hard disk drive in the drive bay:
   a. Grasp the black drive handle and slide the blue release latch to the right and align the drive assembly with the guide rails in the bay.

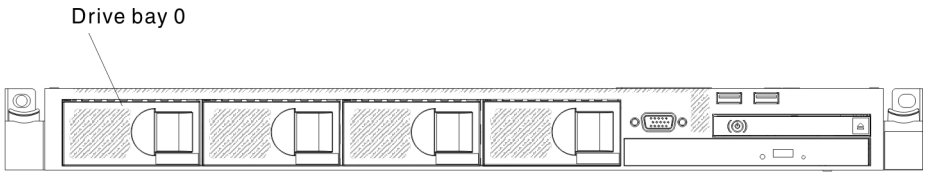




   b. Gently push the drive into the bay until the drive stops.
6. Reinstall the drive bay filler panel that you removed earlier.
7. If you are installing additional simple-swap hard disk drives, do so now.

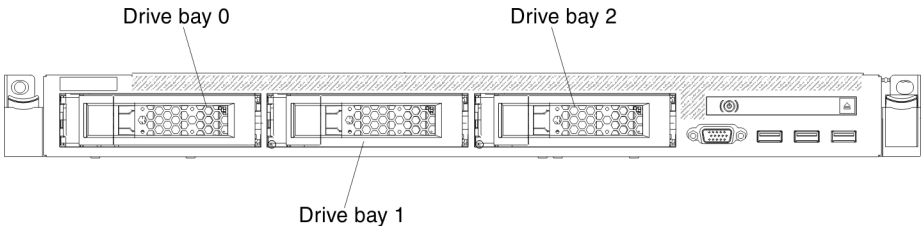
IDs for 2.5-inch simple-swap hard disk drives

The simple-swap-drive ID that is assigned to each drive is printed on the front of the server. The following illustration shows the location of the IDs of the hard disk drives. The ID numbers and the drive bay numbers are the same.



IDs for 3.5-inch simple-swap hard disk drives

The simple-swap-drive ID that is assigned to each drive is printed on the front of the server. The following illustration shows the location of the IDs of the simple-swap hard disk drives. The ID numbers and the drive bay numbers are the same.

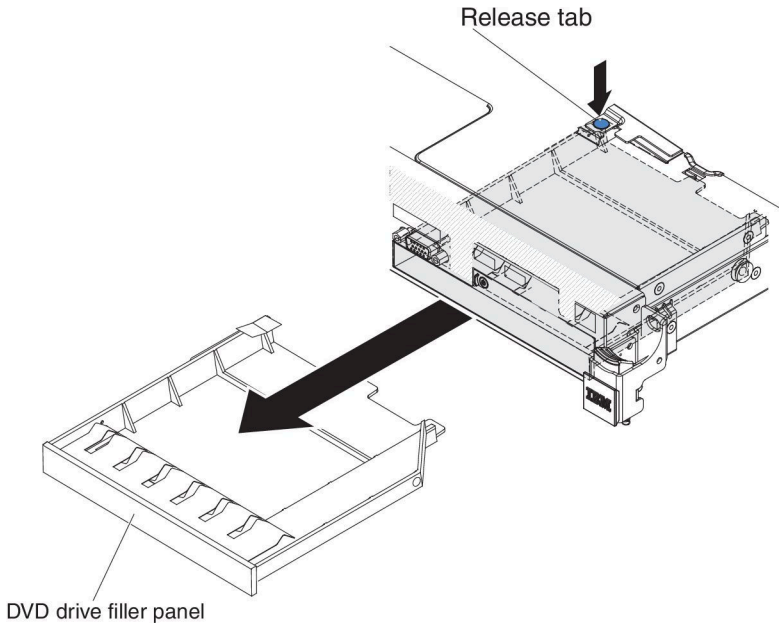


Installing an optional DVD drive

To install an optional DVD drive, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.

   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit, including the LEDs that are lit on the operation information panel, on the light path diagnostics panel, and LEDs inside the server on the system board; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.
3. Remove the cover (see “Removing the cover” on page 50).
4. Remove the optical drive filler panel if it is installed. Locate the blue release tab on the rear of the optical drive filler panel; then, while you press the tab, push the optical drive filler panel out of the drive bay.



5. Remove the retention clip from the side of the optical drive filler panel. Save the optical drive filler panel for future use.

   Note: If you are installing a drive that contains a laser, observe the following safety precautions.

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

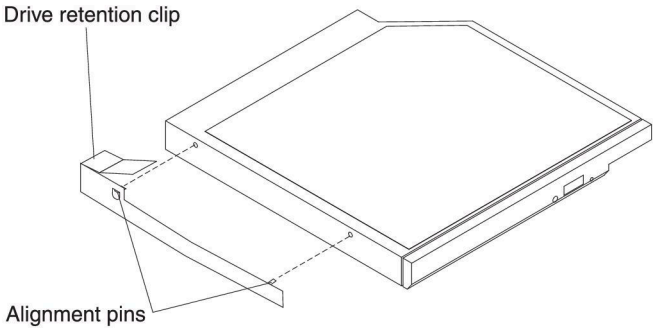
DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

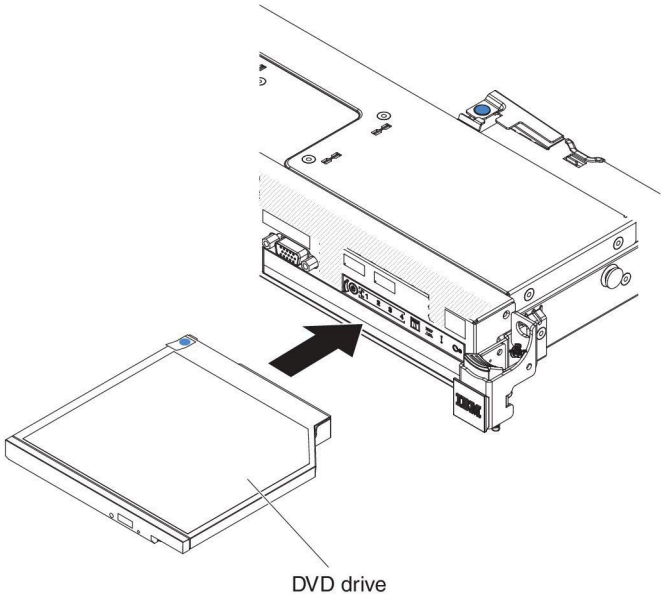
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

6. Touch the static-protective package that contains the new optical drive to any unpainted metal surface on the server; then, remove the optical drive from the package and place it on a static-protective surface.
7. Follow the instructions that come with the DVD drive to set any jumpers or switches.
8. Attach the drive retention clip that you removed from the optical drive filler panel to the side of the DVD drive.

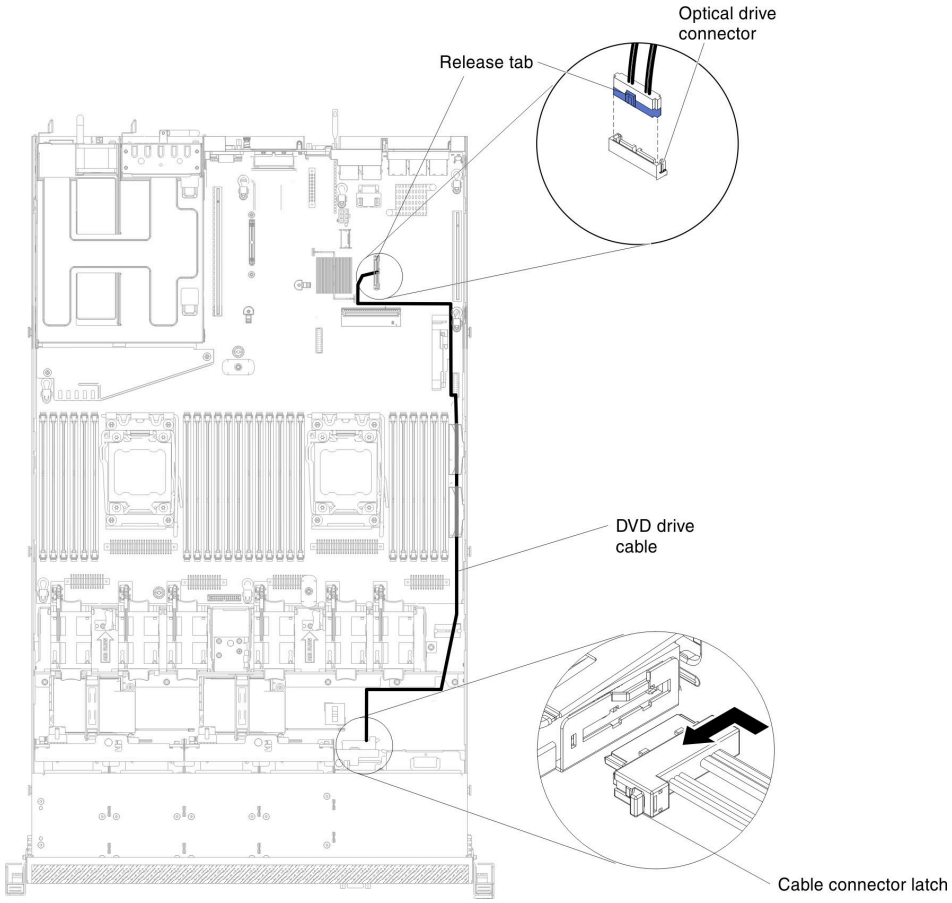


9. Align the drive in the drive bay and slide the drive into the optical drive bay until the drive clicks into place.



10. Connect the DVD drive cable (see “Installing the DVD drive cable” on page 75).

    The following illustration shows the cable routing for the DVD drive:



If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Installing a memory module

The following notes describe the types of DIMMs that the server supports and other information that you must consider when you install DIMMs.

- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.
- The server supports only industry-standard double-data-rate 3 (DDR3), 800, 1066, 1333, or 1600 MHz, PC3-6400, PC3-8500, PC3-10600, or PC3-12800 registered or unbuffered, synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC). See http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/ for a list of supported memory modules for the server.
  - The specifications of a DDR3 DIMM are on a label on the DIMM, in the following format.

    ggggg eRxff PC3*v-wwwwwm-aa-bb-ccd*

    where:

    ggggg is the total capacity of the DIMM (for example, 1GB, 2GB, or 4GB)

    eR is the number of ranks

    1R = single-rank

    2R = dual-rank

4R = quad-rank

xff is the device organization (bit width)

x4 = x4 organization (4 DQ lines per SDRAM)

x8 = x8 organization

x16 = x16 organization

v is the SDRAM and support component supply voltage (VDD)

Blank = 1.5 V specified

L = 1.35 V specified, 1.5 V operable

Note: Values for these voltages are 'specified' which means the device characteristics such as timing are supported at this voltage. Values are 'operable' which means that the devices can be operated safely at this voltage. However, device characteristics such as timing may not be guaranteed. All devices must be 'tolerant' of the highest DDR3 nominal voltage of 1.5 V, meaning that they may not operate at 1.5 V but may be powered at that voltage without damage to the devices.

wwwww is the DIMM bandwidth, in MBps

6400 = 6.40 GBps (DDR3-800 SDRAMs, 8-byte primary data bus)

8500 = 8.53 GBps (DDR3-1066 SDRAMs, 8-byte primary data bus)

10600 = 10.66 GBps (DDR3-1333 SDRAMs, 8-byte primary data bus)

12800 = 12.80 GBps (DDR3-1600 SDRAMs, 8-byte primary data bus)

m is the DIMM type

E = Unbuffered DIMM (UDIMM) with ECC (x72-bit module data bus)

L = Load Reduction DIMM (LRDIMM)

R = Registered DIMM (RDIMM)

U = Unbuffered DIMM with no ECC (x64-bit primary data bus)

aa is the CAS latency, in clocks at maximum operating frequency

bb is the JEDEC SPD Revision Encoding and Additions level

cc is the reference design file for the design of the DIMM

d is the revision number of the reference design of the DIMM

Note: To determine the type of a DIMM, see the label on the DIMM. The information on the label is in the format xxxxx nRxxx PC3v-xxxxxx-xx-xx-xxx. The numeral in the sixth numerical position indicates whether the DIMM is single-rank (n=1), dual-rank (n=2), or quad-rank (n=4).

- The following rules apply to DDR3 RDIMM speed as it relates to the number of RDIMMs in a channel:
  - When you install 1 RDIMM per channel, the memory runs at 1600 MHz
  - When you install 2 RDIMMs per channel, the memory runs at 1600 MHz
  - When you install 3 RDIMMs per channel, the memory runs at 1066 MHz
  - All channels in a server run at the fastest common frequency
  - Do not install registered, unbuffered, and load reduction DIMMs in the same server
- The maximum memory speed is determined by the combination of the microprocessor, DIMM speed, DIMM type, Operating Modes in UEFI settings, and the number of DIMMs installed in each channel.

- In two-DIMM-per-channel configuration, a server with an Intel Xeon™ E5-2600 series microprocessor automatically operates with a maximum memory speed of up to 1600 MHz when the following condition is met:
  - Two 1.35 V single-rank, dual-ranl, or quad-rank UDIMMs, RDIMMs or LRDIMMs are installed in the same channel. In the Setup utility, **Memory speed** is set to **Max performance** and **LV-DIMM power** is set to **Enhance performance** mode. The 1.35 V UDIMMs, RDIMMs or LRDIMMs will function at 1.5 V.
- The server supports a maximum of 16 dual-rank UDIMMs. The server supports up to two UDIMMs per channel.
- The server supports a maximum of 24 single-rank, dual-rank, or 16 quad-rank RDIMMs. The server does not support three quad-rank RDIMMs in the same channel.
- The following table shows an example of the maximum amount of memory that you can install using ranked DIMMs:

Table 6. Maximum memory installation using ranked DIMMs

Number of DIMMs	DIMM type	DIMM size	Total memory
16	Dual-rank UDIMMs	4 GB	64 GB
24	Single-rank RDIMMs	2 GB	48 GB
24	Single-rank RDIMMs	4 GB	96 GB
24	Dual-rank RDIMMs	8 GB	192 GB
24	Dual-rank RDIMMs	16 GB	384 GB
16	Quad-rank RDIMMs	16 GB	256 GB
24	Quad-rank LRDIMMs	32 GB	768 GB

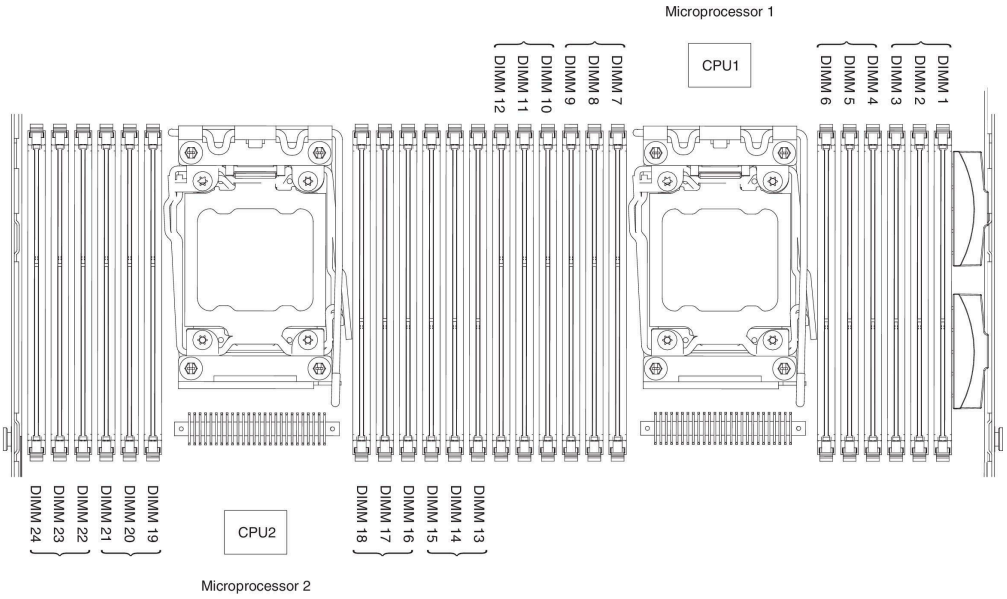
- The UDIMM option that is available for the server is 4 GB. The server supports a minimum of 4 GB and a maximum of 64 GB of system memory using UDIMMs.
- The RDIMM options that are available for the server are 2 GB, 4 GB, 8 GB, and 16 GB. The server supports a minimum of 2 GB and a maximum of 384 GB of system memory using RDIMMs.
- The LRDIMM option that is available for the server is 32 GB. The server supports a minimum of 32 GB and a maximum of 768 GB of system memory using LRDIMMs.

  Note: The amount of usable memory is reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. To view the total amount of installed memory and the amount of configured memory, run the Setup utility. For additional information, see Chapter 3, “Configuring the server,” on page 105.
- A minimum of one DIMM must be installed for each microprocessor. For example, you must install a minimum of two DIMMs if the server has two microprocessors installed. However, to improve system performance, install a minimum of four DIMMs for each microprocessor.
- DIMMs in the server must be the same type (RDIMM, UDIMM, or LRDIMM) to ensure that the server will operate correctly.
- When you install one quad-rank DIMM in a channel, install it in the DIMM connector furthest away from the microprocessor.

Notes:

1. You can install DIMMs for microprocessor 2 as soon as you install microprocessor 2; you do not have to wait until all of the DIMM slots for microprocessor 1 are filled.
2. DIMM slots 13-24 are reserved for microprocessor 2; thus, DIMM slots 13-24 are enabled when microprocessor 2 is installed.

The following illustration shows the location of the DIMM connectors on the system board.



DIMM installation sequence

Depending on the server model, the server may come with a minimum of one 2 GB or 4 GB DIMM installed in slot 1. When you install additional DIMMs, install them in the order shown in the following table to optimize system performance. In general, all three channels on the memory interface for each microprocessor can be populated in any order and have no matching requirements.

Table 7. Normal mode DIMM installation sequence

Number of installed microprocessor	**DIMM connector population sequence**
One microprocessor installed	1, 4, 9, 12, 2, 5, 8, 11, 3, 6, 7, 10
Two microprocessors installed	1, 13, 4, 16, 9, 21, 12, 24, 2, 14, 5, 17, 8, 20, 11, 23, 3, 15, 6, 18, 7, 19, 10, 22

Memory mirrored channel

Memory mirrored channel mode replicates and stores data on two pairs of DIMMs within two channels simultaneously. If a failure occurs, the memory controller switches from the primary pair of memory DIMMs to the backup pair of DIMMs. You can enable memory mirrored channel in the Setup utility (see “Starting the Setup utility” on page 109). When you use the memory mirrored channel feature, consider the following information:

- When you use memory mirrored channel, you must install a pair of DIMMs at a time. The two DIMMs in each pair must be identical in size, type, and rank (single, dual, or quad), and organization, but not in speed. The channels run at the speed of the slowest DIMM in any of the channels.
- The maximum available memory is reduced to half of the installed memory when memory mirrored channel is enabled. For example, if you install 64 GB of memory using RDIMMs, only 32 GB of addressable memory is available when you use memory mirrored channel.
- For UDIMMs, DIMM connectors 3, 6, 7, and 10 for microprocessor 1 and DIMM connectors 15, 18, 19, and 22 for microprocessor 2 are not used in memory mirrored channel mode.

The following diagram lists the DIMM connectors on each memory channel.

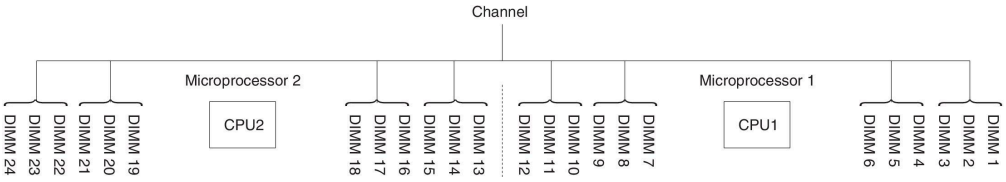


Figure 1. Connectors on each memory channel

The following table shows the installation sequence for memory mirrored channel mode:

Table 8. Memory mirrored channel mode DIMM population sequence

Number of DIMMs	Number of installed microprocessor	DIMM connector
First pair of DIMMs	1	1, 4
Second pair of DIMMs	1	9, 12
Third pair of DIMMs	1	2, 5
Fourth pair of DIMMs	1	8, 11
Fifth pair of DIMMs	1	3, 6
Sixth pair of DIMMs	1	7, 10
Seventh pair of DIMMs	2	13, 16
Eighth pair of DIMMs	2	21, 24
Ninth pair of DIMMs	2	14, 17
Tenth pair of DIMMs	2	20, 23
Eleventh pair of DIMMs	2	15, 18
Twelfth pair of DIMMs	2	19, 22
Note: DIMM connectors 3, 6, 7, 10, 15, 18, 19, and 22 are not used in memory mirrored channel mode when UDIMMs are installed in the server.		

Memory rank sparing

The memory rank sparing feature disables the failed memory from the system configuration and activates a rank sparing DIMM to replace the failed active DIMM. You can enable either rank sparing memory or memory mirrored channel in the Setup utility (see “Starting the Setup utility” on page 109). When you use the memory rank sparing feature, consider the following information:

- The memory rank sparing feature is supported on server models with an Intel Xeon™ E5-2600 series microprocessor.
- The maximum available memory is reduced when memory rank sparing mode is enabled.

The following diagram lists the DIMM connectors on each memory channel.

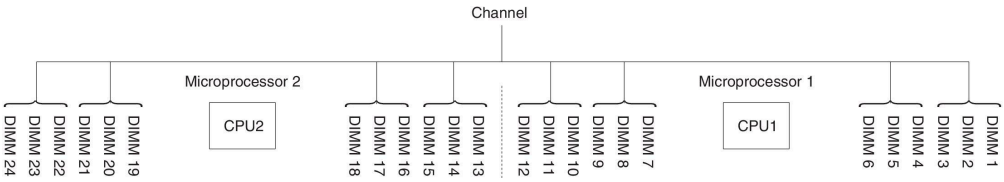


Figure 2. Connectors on each memory channel

Follow the installation sequence for rank sparing mode:

- Install at least one quad-rank DIMM in a channel.
- Install at least two single-rank or dual-rank DIMMs in a channel.

Table 9. Memory rank sparing mode DIMM population sequence

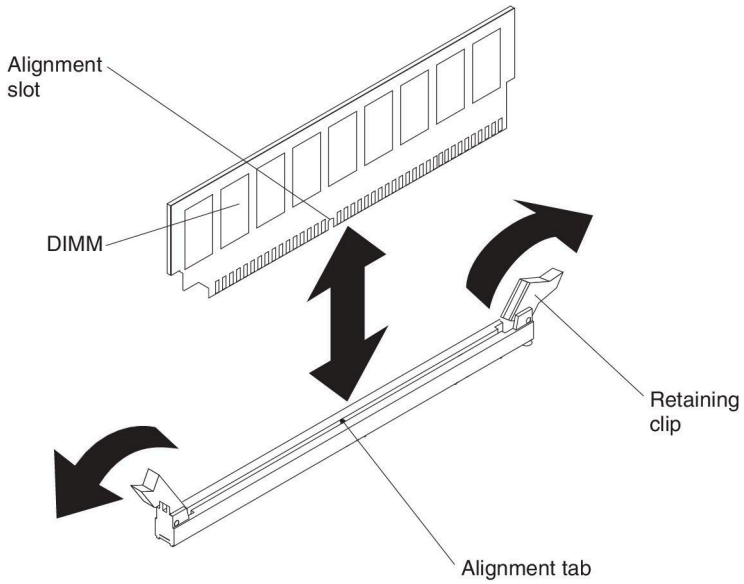
Number of DIMMs	Number of installed microprocessor	DIMM connector
First pair of DIMMs	1	1, 2
Second pair of DIMMs	1	4, 5
Third pair of DIMMs	1	8, 9
Fourth pair of DIMMs	1	11, 12
Fifth pair of DIMMs	1	7, 10
Sixth pair of DIMMs	1	3, 6
Seventh pair of DIMMs	2	13, 14
Eighth pair of DIMMs	2	16, 17
Ninth pair of DIMMs	2	20, 21
Tenth pair of DIMMs	2	23, 24
Eleventh pair of DIMMs	2	19, 22
Twelfth pair of DIMMs	2	15, 18
Note: DIMM connectors 3, 6, 7, 10, 15, 18, 19, and 22 are not used in memory rank sparing mode when UDIMMs are installed in the server.		

Installing a DIMM

To install a DIMM, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.
3. Remove the cover (see “Removing the cover” on page 50).
4. Remove the air baffle (see “Removing the air baffle” on page 51).
5. Open the retaining clip on each end of the DIMM connector.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.



6. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.
7. Turn the DIMM so that the alignment slot align correctly with the alignment tab.
8. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector (see “System-board optional devices connectors” on page 38 for the locations of the DIMM connectors).
9. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

   Note: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.

   If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Replacing a PCI riser-card assembly

Note: PCI riser-card brackets must be installed even if you do not install an adapter.

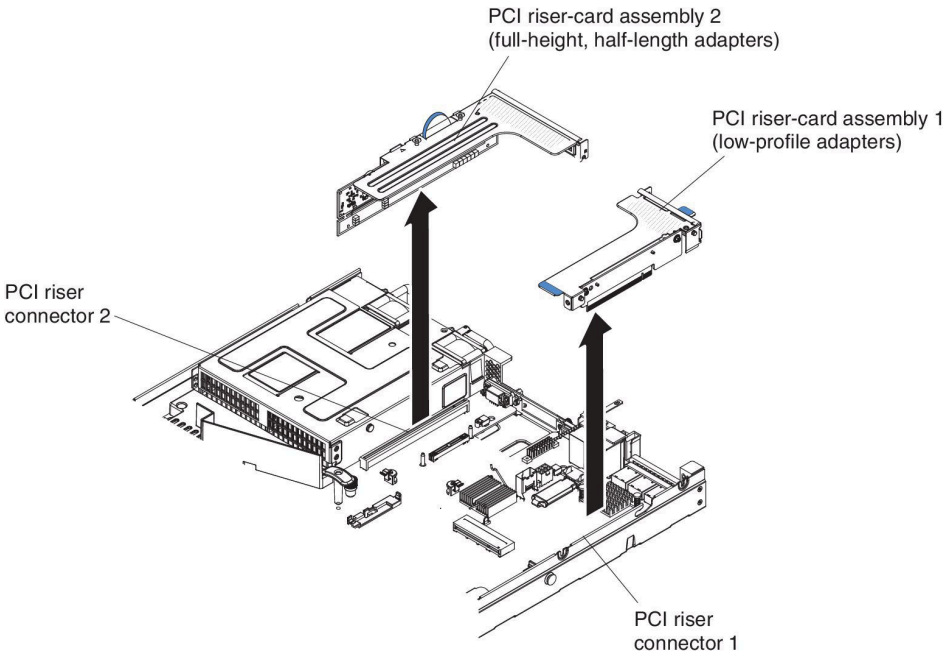
To replace a PCI riser-card assembly, complete the following steps:

1. Read the safety information that begins on page vii and the “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.

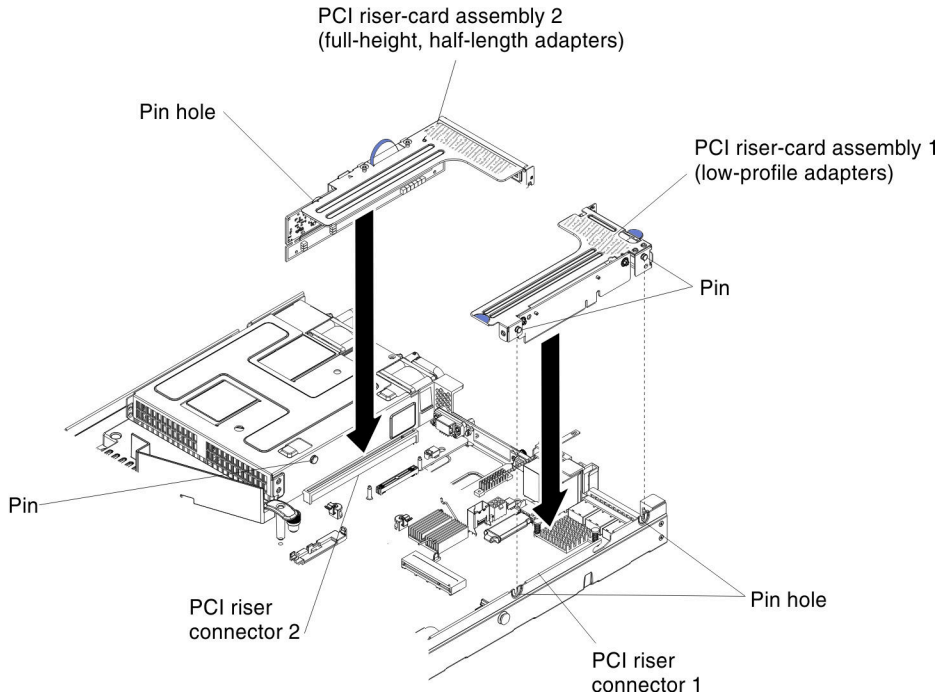
   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit, including the LEDs that are lit on the operation information panel, on the light path diagnostics panel, and

LEDs inside the server on the system board; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.

3. Remove the cover (see “Removing the cover” on page 50).
4. Grasp both ends or the handle of the PCI riser-card assembly and lift it out of the PCI riser-card slot on the system board.



5. If an adapter is installed in the riser-card assembly, disconnect any cables that are connected to the adapter.
6. Remove the adapter, if one is present, from the PCI riser-card assembly.
7. Set the adapter and the PCI riser-card assembly aside.
8. Install the adapter in the new PCI riser-card assembly (see “Installing an adapter” on page 67).
9. Set any jumpers or switches on the adapter as directed by the adapter manufacturer.
10. Remove the PCI filler panel, if one is present, from the rear of the server.
11. Align the PCI riser-card assembly with the PCI riser connector on the system board; then, press down firmly until the riser-card assembly is seated correctly in the connector on the system board.



If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Installing an adapter

The following notes describe the types of adapters that the server supports and other information that you must consider when you install an adapter:

- To confirm that the server supports the adapter that you are installing, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section.
- The server provides one internal SAS/SATA RAID connector and two PCI slots on the system board. See “System-board optional devices connectors” on page 38 for the location of the internal SAS/SATA RAID connector and SAS/SATA RAID riser-card slots. You can replace the IBM ServeRAID SAS/SATA adapter with an optional IBM ServeRAID SAS/SATA adapter in the slot. For configuration information, see the ServeRAID documentation at http://www.ibm.com/supportportal/.
- Do not set the maximum digital video adapter resolution above 1600 x 1200 at 75 Hz for an LCD monitor. This is the highest resolution that is supported for any add-on video adapter that you install in the server.
- Do not install memory modules more than 128 GB when Quadro 600 is installed.
- Read the following table before installing NAND flash adapters.

Table 10. NAND flash configurations

Description	Option part number	PCI riser 1	PCI riser 2
IBM 365 GB High IOPS MLC mono adapter	46C9078	Two microprocessors installed	Two microprocessors installed

Table 10. NAND flash configurations (continued)

Description	Option part number	PCI riser 1	PCI riser 2
IBM 785 GB High IOPS MLC mono adapter	46C9081	Two microprocessors installed	Two microprocessors installed
IBM 1.2 TB high IOPS MLC mono adapter	90Y4377	Two microprocessors installed	Two microprocessors installed
IBM 2.4 TB high IOPS MLC duo adapter	90Y4397		Two microprocessors installed

- Any high-definition video-out connector or stereo connector on any add-on video adapter is not supported
- The server does not support full-length, full-height PCI adapters or legacy 5V PCI adapters.
- When you install any PCI adapter, the power cords must be disconnected from the power source before you remove the PCI Express riser-card assembly and the PCI-X riser-card assembly. Otherwise, the active power management event signal will be disabled by the system-board logic, and the Wake on LAN feature might not work. However, after the server is powered-on locally, the active power manager active power management event signal will be enabled by the system-board logic.
- The server provides two PCI riser-card slots on the system board. The following information describes the PCI riser-card slots and the type of adapters that the riser cards support:
  - If you want to install a PCI Express or PCI-X adapter, you must order the PCI riser-card option.
  - PCI riser slot 1. This slot supports only low-profile adapters.
  - PCI riser slot 2. This slot supports full-height, half-length adapters.

  The following table lists the supported configurations for the PCI riser-card slots.

Table 11. PCI riser slots supported configurations

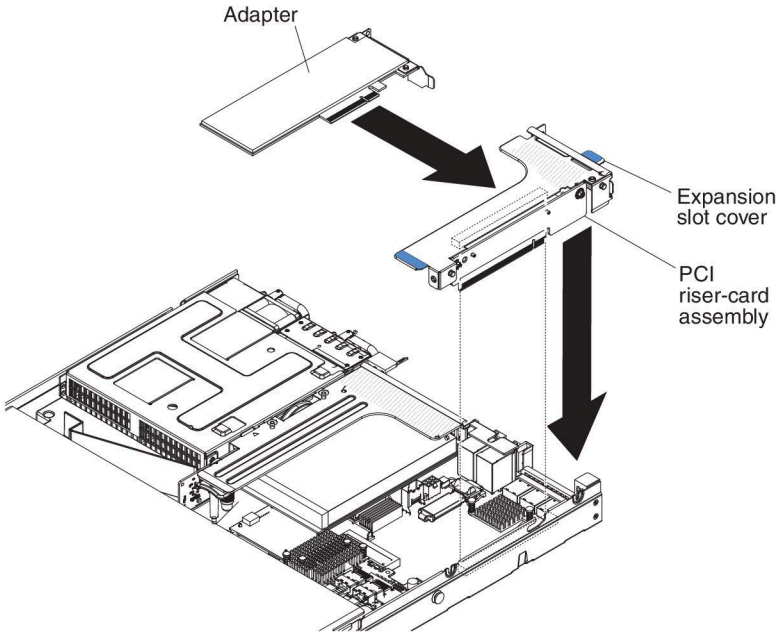
PCI riser-card slot number	Configuration 1	Configuration 2 (Two microprocessors installed)	Configuration 3
Slot 1	PCI Express 3.0 (x16) card with a PCI Express riser card with a standard bracket	PCI Express 3.0 (x16) card with a PCI Express riser card with a standard bracket	PCI Express 3.0 (x16) card with a PCI Express riser card with a standard bracket
Slot 2	PCI Express 3.0 (x8) card with a PCI Express riser card with a standard bracket	PCI Express 3.0 (x16) card with a PCI Express riser card with a standard bracket	PCI-X 64-bit/133 MHz card with a PCI-X riser card with a standard bracket

Notes:

1. The instructions in this section apply to any PCI adapter (for example, video graphics adapters or network adapters).
2. Do not set the maximum digital video adapter resolution above 1600 x 1200 at 75 Hz for an LCD monitor. This is the highest resolution that is supported for any add-on video adapter that you install in the server.
3. Any high-definition video-out connector or stereo connector on any add-on video adapter is not supported

To install an adapter, complete the following steps:

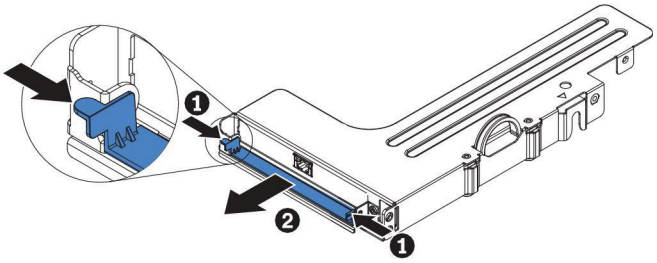
1. Read the safety information that begins on page vii and the “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.
3. Remove the server cover (see “Removing the cover” on page 50).
4. Follow the cabling instructions, if any come with the adapter. Route the adapter cables before you install the adapter.
5. Insert the adapter into the riser-card assembly, aligning the edge connector on the adapter with the connector on the riser-card assembly. Press the edge of the connector *firmly* into the riser-card assembly. Make sure that the adapter snaps into the riser-card assembly securely.



Attention: When you install an adapter, make sure that the adapter is correctly seated in the riser-card assembly and that the riser-card assembly is securely seated in the riser-card connector on the system board before you turn on the server. An incorrectly seated adapter might cause damage to the system board, the riser-card assembly, or the adapter.

6. Install the riser-card assembly in the server (see “Replacing a PCI riser-card assembly” on page 65).
7. Connect the cable to the newly-installed adapter.

Note: You might need to remove the blue latch from PCI riser-card assembly 2 to easily connect the cables.



8. Perform any configuration tasks that are required for the adapter.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Removing a ServeRAID SAS/SATA controller

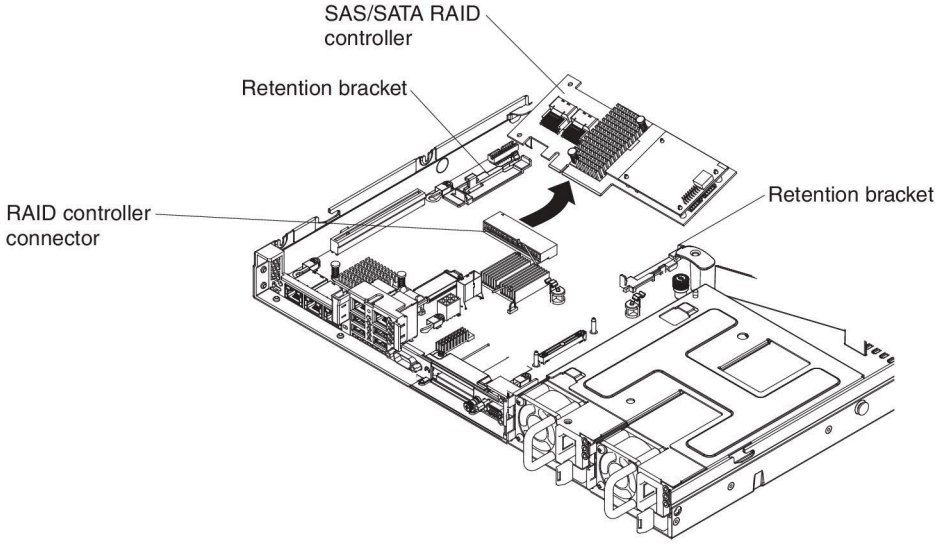
The ServeRAID SAS/SATA controller can be installed in the dedicated connector on the system board or PCI riser-card slots (see “System-board internal connectors” on page 33 for the location of the connectors).

You can replace the ServeRAID controller with another supported ServeRAID controller. For a list of supported ServeRAID controllers, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Note: For brevity, in this documentation the ServeRAID SAS/SATA controller is often referred to as the *SAS/SATA adapter* or the *ServeRAID adapter*.

To remove the SAS/SATA adapter from the system board, complete the following steps:

1. Read the safety information that begins on page vii and the “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the cover (see “Removing the cover” on page 50).
4. Locate the SAS/SATA adapter between PCI slot 1 and microprocessor 1.
5. Disconnect the signal cables and power cables from the connectors on the SAS/SATA adapter and note their locations.
6. Grasp the end of the SAS/SATA adapter near microprocessor 1 while you slide the brackets. Slide the retention bracket (near the chassis) toward the chassis; then, slide the other retention bracket toward the power supplies.



Note: If you have installed the optional ServeRAID adapter memory card, remove it and keep it in future use.

7. Pull the SAS/SATA adapter horizontally out of the connector on the system board.

Installing a ServeRAID SAS/SATA controller

The adapter can be installed in the dedicated connector on the system board or PCI riser-card slots (see “System-board internal connectors” on page 33 for the location of the connectors). To install a SAS/SATA adapter, complete the following steps:

Depending on the server model, the server comes with a ServeRAID H1110, a ServeRAID M1115, a ServeRAID M5110, or a ServeRAID 5210 SAS/SATA adapter installed.

Note: Remove the PCI bracket that come with ServeRAID H1110, ServeRAID M1115, ServeRAID M5110 SAS/SATA, or a ServeRAID 5210 adapter before installing a SAS/SATA adapter in the dedicated connector on the system board.

You can not install ServeRAID H1110 when microprocessor Intel Xeon E5-2637 (FRU part number 49Y8124) is installed.

You can not install ServeRAID M1115 or IBM 6Gb performance optimized HBA when Quadro 2000 is installed.

You can replace the ServeRAID controller with another supported ServeRAID controller. For a list of supported ServeRAID controllers, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

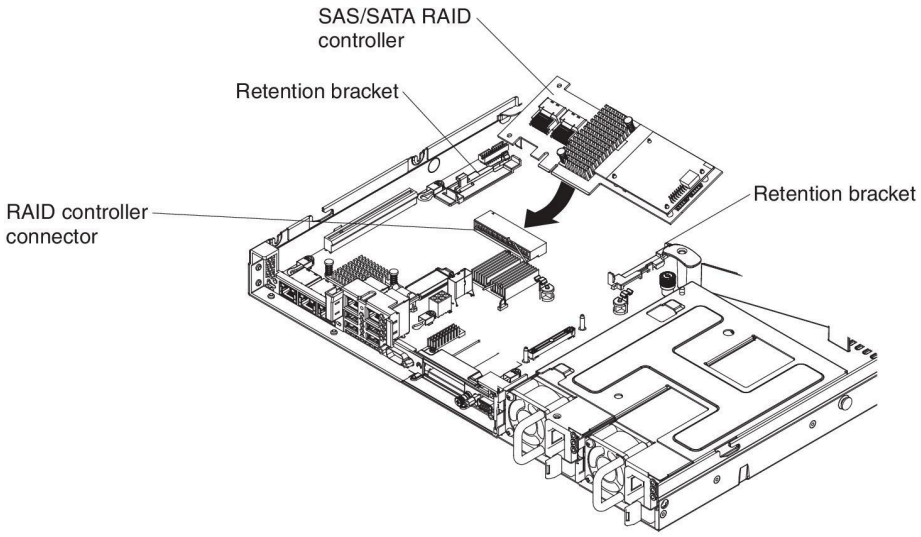
Note: For brevity, in this documentation the ServeRAID SAS/SATA controller is often referred to as the *SAS/SATA adapter* or the *ServeRAID adapter*.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the cover (see “Removing the cover” on page 50).
4. Remove PCI riser-card assembly 1 if necessary (see “Replacing a PCI riser-card assembly” on page 65).
5. If you are installing a new or replacement SAS/SATA adapter, touch the static-protective package that contains the new SAS/SATA adapter to any unpainted metal surface on the server. Then, remove the new SAS/SATA adapter from the package.
6. Align the SAS/SATA adapter so that the keys align correctly with the connector on the system board.
7. Insert the SAS/SATA adapter in the dedicated connector on the system board or PCI riser-card slots.

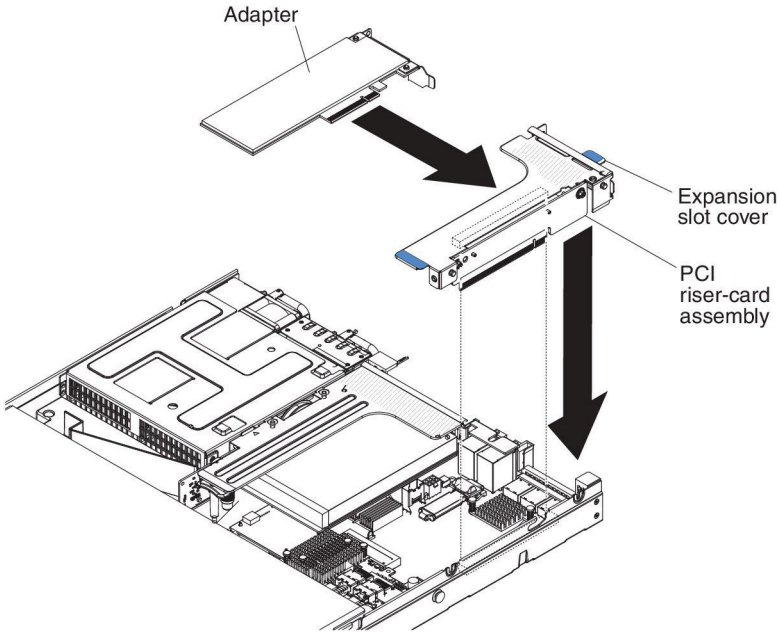
   Attention: Incomplete insertion might cause damage to the server or the adapter.

   a. Insert the SAS/SATA adapter into the RAID connector on the system board until it is firmly seated. The retention brackets secure the SAS/SATA adapter in place when the adapter is firmly seated into the connector.

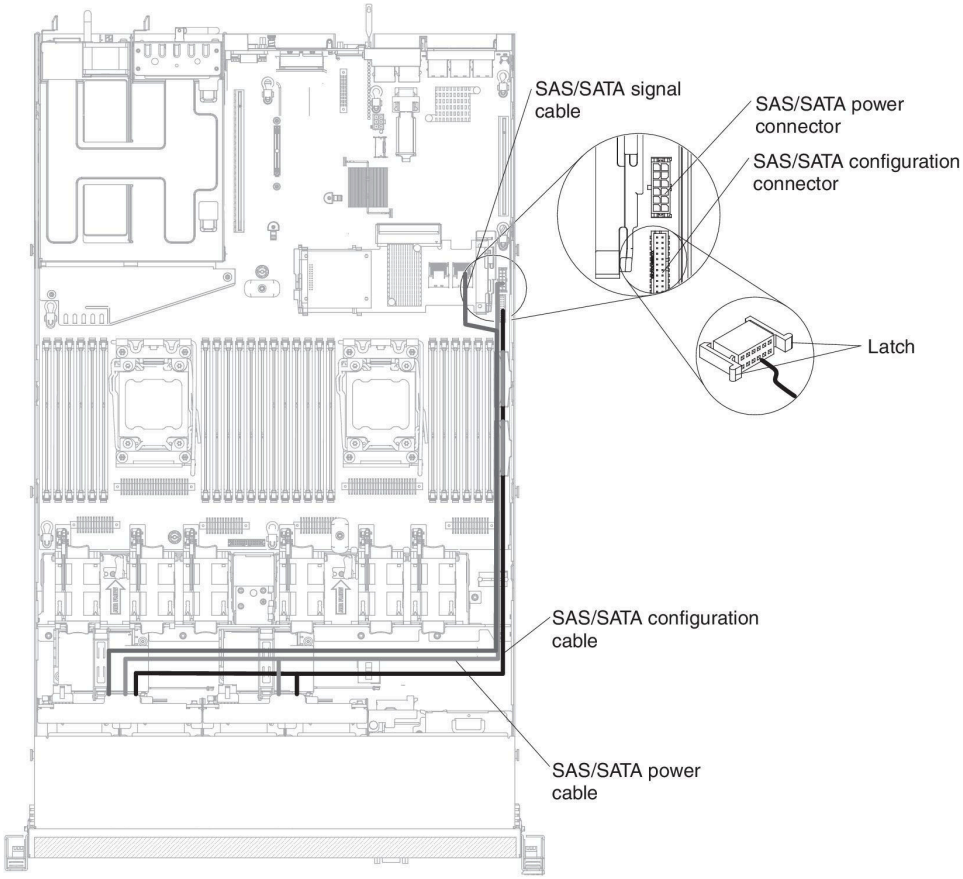
      Note: Remove the PCI bracket that come with ServeRAID H1110, ServeRAID M1115, or ServeRAID M5110 SAS/SATA adapter before installing a SAS/SATA adapter in the dedicated connector on the system board.


SAS/SATA RAID
controller
Retention bracket
RAID controller
connector
Retention bracket

b. Insert the SAS/SATA adapter into the PCI riser cards. (see “Installing an adapter” on page 67).

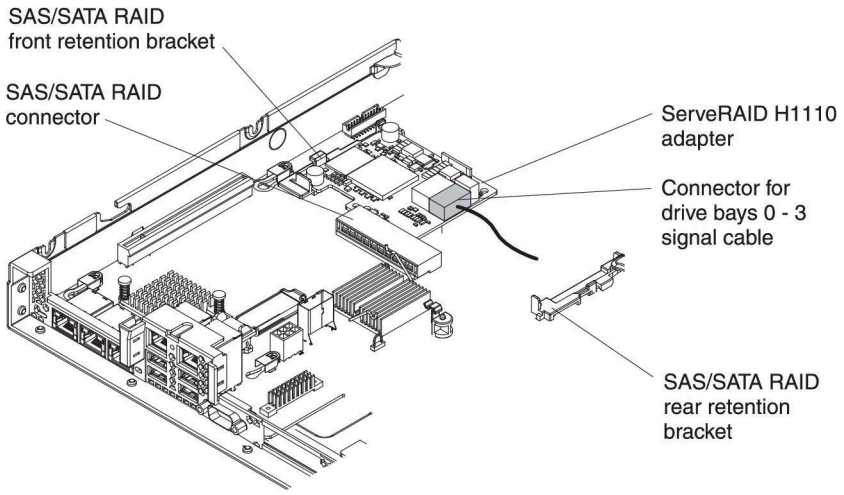


8. Route the backplane signal cables (see “Internal cable routing and connectors” on page 41).

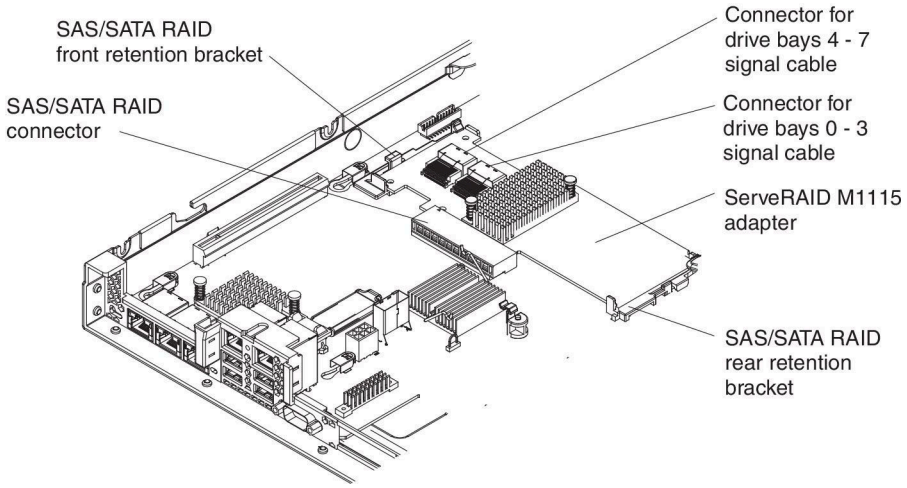


9. Connect the signal cables to the SAS/SATA adapter:

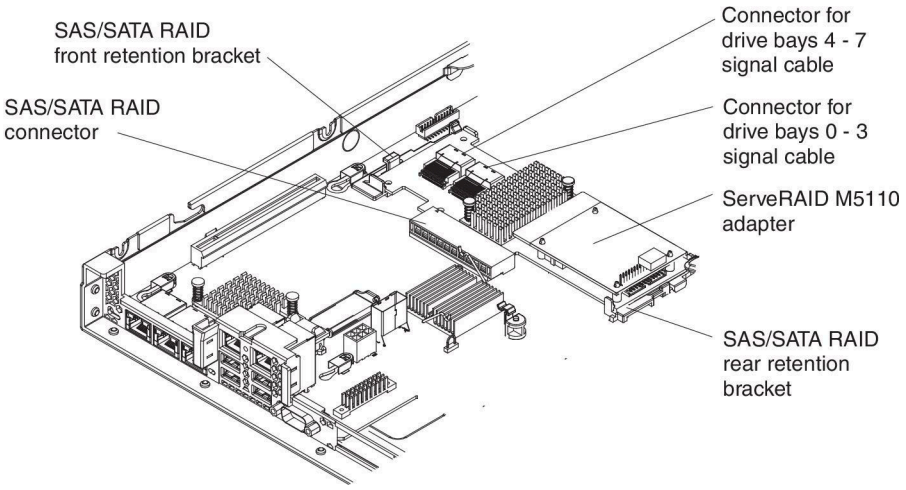
- **ServeRAID H1110 adapter**: Take the signal cable that is attached to the drive backplane for drive bays 0 through 3 and connect it to the SAS/SATA connector on the ServeRAID adapter.



- **ServeRAID M1115 adpater:** Take the signal cable that is attached to the drive backplane for drive bays 4 through 7 and connect it to the ServeRAID adapter connector for drive bays 4 through 7 (port 1). Connect the other signal cable that is attached to the drive backplane for drive bays 0 through 3 and connect it to the other connector (port 0) on the adapter.



- **ServeRAID M5110 adapter**: Take the signal cable that is attached to the drive backplane for drive bays 4 through 7 and connect it to the ServeRAID adapter connector for drive bays 4 through 7 (port 1). Connect the other signal cable that is attached to the drive backplane for drive bays 0 through 3 and connect it to the other connector (port 0) on the adapter.



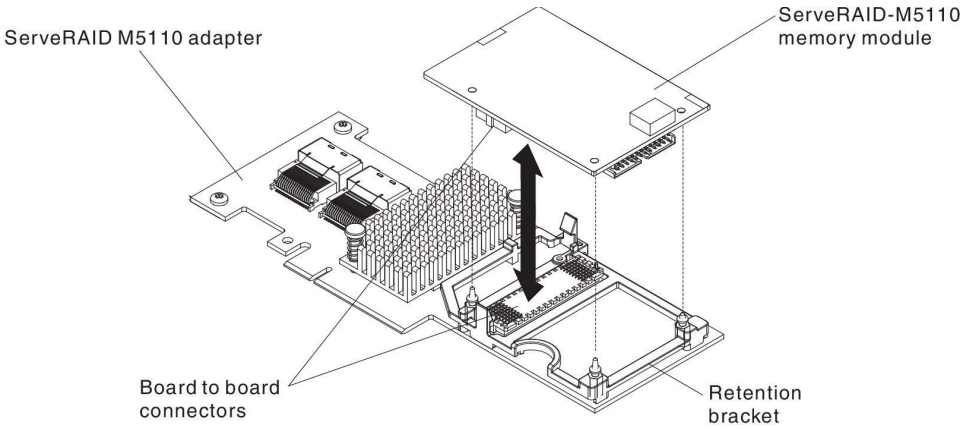
Note: When you restart the server, you are prompted to import the existing RAID configuration to the new ServeRAID adapter.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 101.

Installing an optional ServeRAID adapter memory module

To install an optional ServeRAID adapter memory module, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the cover (see "Removing the cover" on page 50).
4. Align the memory module with the connector on the ServeRAID adapter and push it into the connector until it is firmly seated.

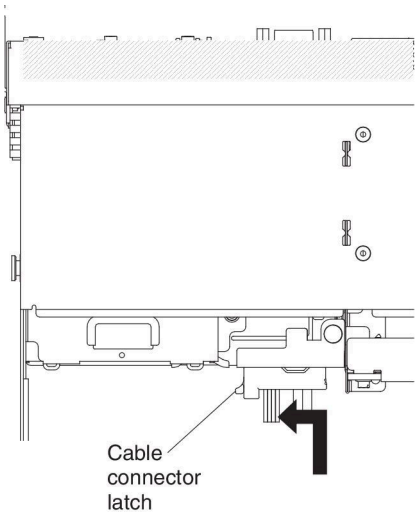


If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 101.

Installing the DVD drive cable

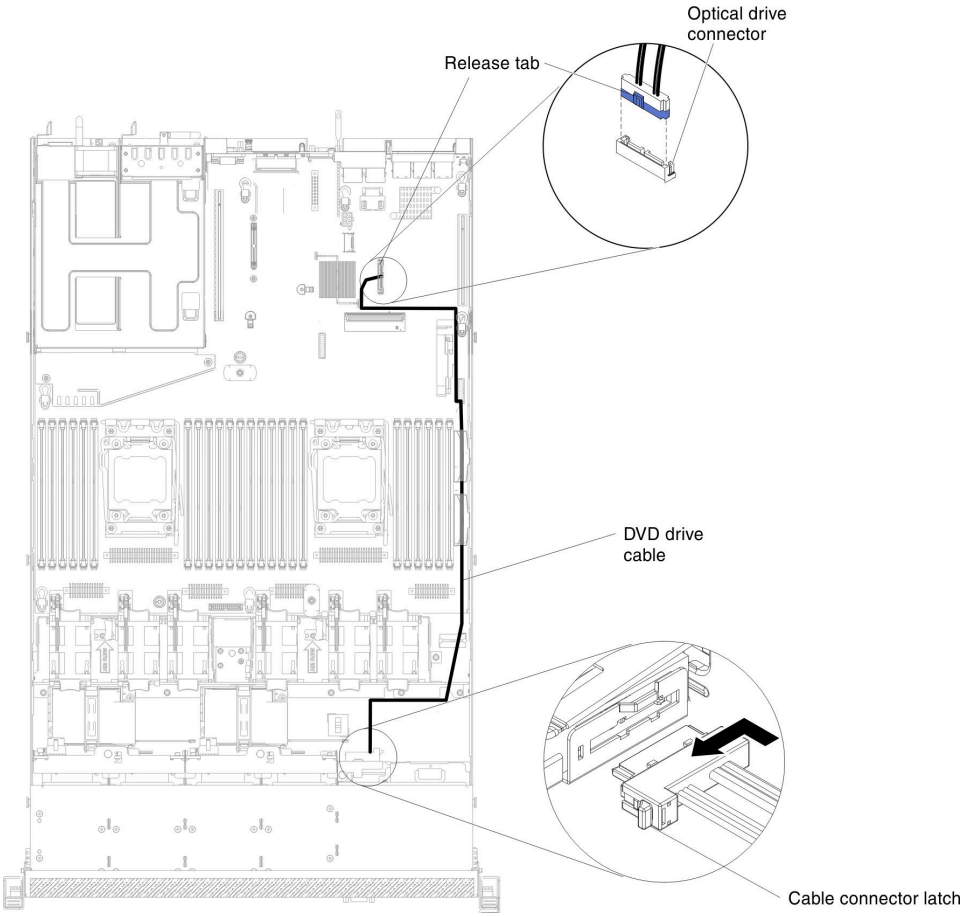
To install the DVD drive cable, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.
3. Remove the cover (see “Removing the cover” on page 50).
4. Remove the air baffle (see “Removing the air baffle” on page 51).
5. Align the cable connector with the connector on the rear of the DVD drive cage. Press the cable connector into the optical drive cage connector and slide it to the left until it is firmly seated.



The following illustration shows cable routing for the DVD cable:

Attention: Follow the optical drive cable routing as the illustration shows. Make sure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.



If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Installing a SAS/SATA 4 Pac HDD option

You can install an IBM System x3550 M4 hot-swap SAS/SATA 4 Pac HDD option to add four additional 2.5-inch hot-swap hard disk drives in the server. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported optional devices. To order a SAS/SATA 4 Pac HDD option, contact your IBM marketing representative or authorized reseller.

The SAS/SATA 4 Pac HDD option kit contains the following components:

- One 2.5-inch hot-swap hard disk drive backplane (with bracket)
- Four drive bay filler panels
- One SAS signal cable

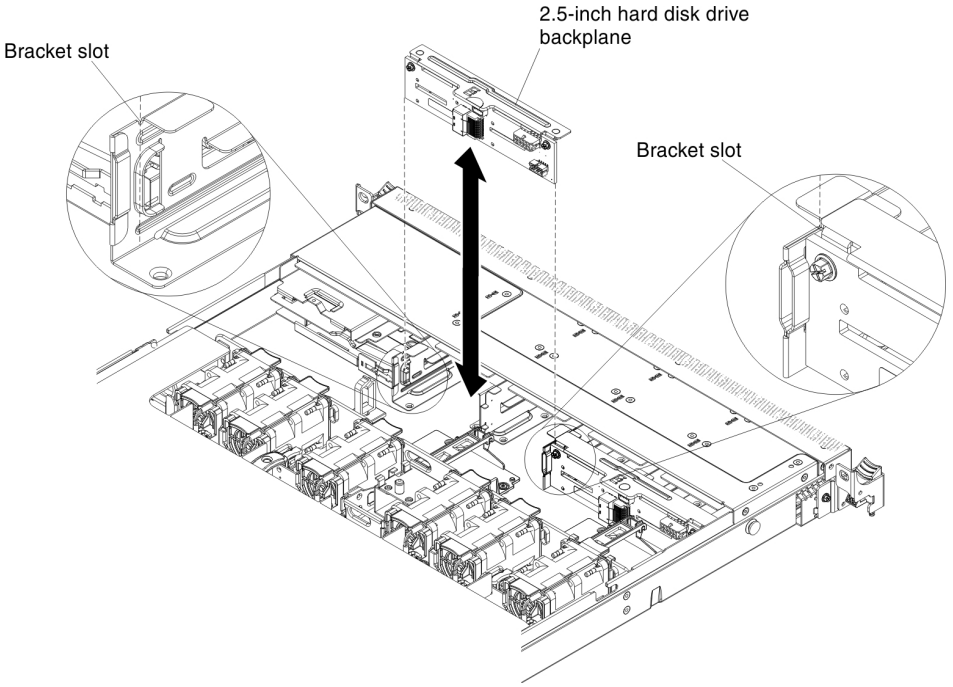
Note: The 4 pac HDD option including structural parts and Tier 1 parts.

To install a SAS/SATA 4 Pac HDD option, complete the following steps:

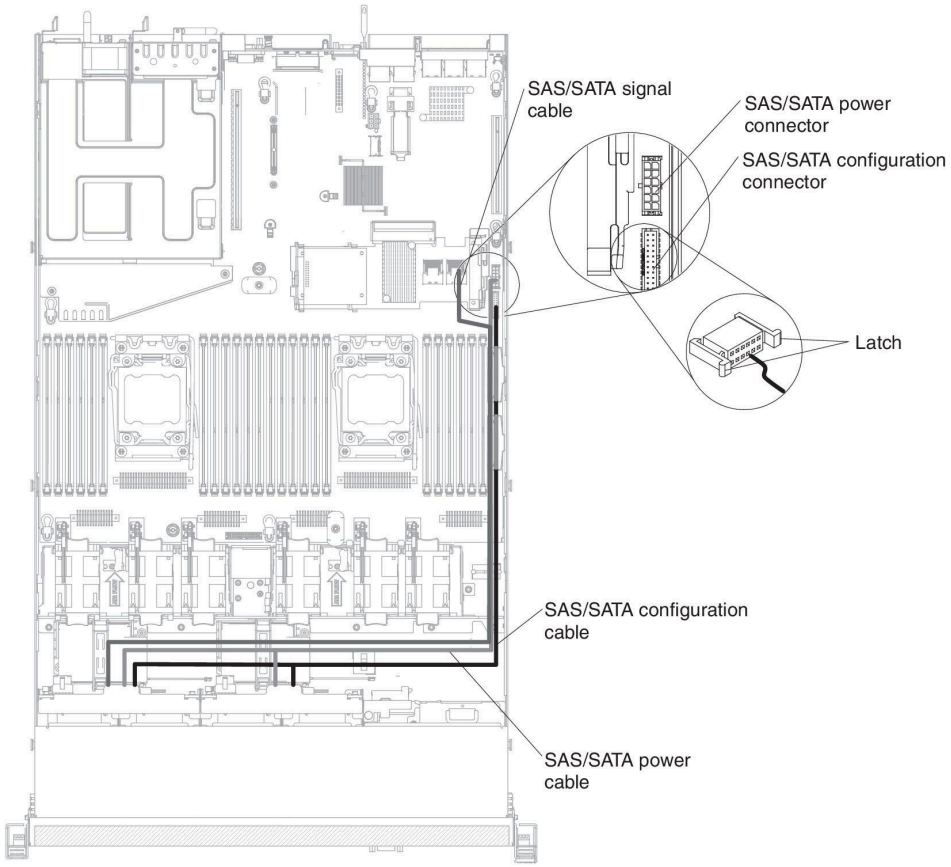
1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.
3. Remove the cover (see “Removing the cover” on page 50).

4. Align the sides of the hard disk drive backplane with the slots on the backplane bracket.
5. Insert the hard disk drive backplane into the slots on the backplane bracket and push the hard disk drive backplane down until the backplane is fully seated.

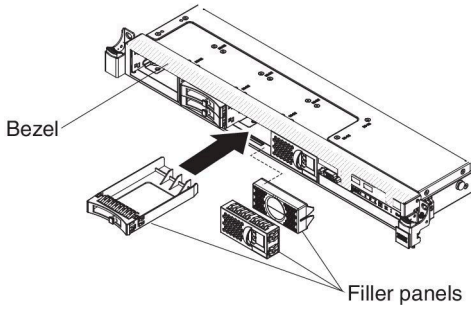
   Note: You can reconnect the cables to the hard disk drive backplane before installing the backplane onto the brackets or you can connect the cables after you install the backplane, if that is easier for you.



6. Connect the cables to the hard disk drive backplane.
7. Connect the signal, power and configuration cables to the system board. Route the signal cable from the drive backplane along the chassis and connect it to the SAS/SATA controller connectors (see step 9 on page 73). Then, route the power cable and the configuration cable from the drive backplane along the chassis and connect it to the SAS/SATA power connector and SAS/SATA configuration connector, as shown in the following illustration.



8. Pull existing filler panels out of the server. Keep them in a safe place.



9. Install the hard disk drives.
10. Install the filler panels that come with the SAS/SATA 4 Pac HDD option into empty drive bays.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Installing a second microprocessor and heat sink

The following notes describe the type of microprocessor that the server supports and other information that you must consider when you install a microprocessor and heat sink:

- Microprocessors are to be installed only by trained technicians.

  Important: Always use the microprocessor installation tool to install a microprocessor. Failing to use the microprocessor installation tool may damage

the microprocessor sockets on the system board. Any damage to the microprocessor sockets may require replacing the system board.

- The server supports up to two Intel Xeon™ E5-2600 series multi-core microprocessors, which are designed for the LGA 2011 socket. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported microprocessors.
- Do not mix dual-core, quad-core, and six-core microprocessors in the same server.
- The first microprocessor must always be installed in microprocessor socket 1 on the system board.
- When one microprocessor is installed, the air baffle must be installed to provide proper system cooling.
- Do not remove the first microprocessor from the system board when you install the second microprocessor.
- When you install the second microprocessor, you must also install additional memory, the fourth and sixth fans. See “Installing a memory module” on page 59 for details about the installation sequence.
- To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same QuickPath Interconnect (QPI) link speed, integrated memory controller frequency, core frequency, power segment, internal cache size, and type.
- Mixing microprocessors of different stepping levels within the same server model is supported.
- When mixing microprocessors with different stepping levels within the same server model, you do not have to install the microprocessor with lowest stepping level and features in microprocessor socket 1.
- Both microprocessor voltage regulator modules are integrated on the system board.
- Read the documentation that comes with the microprocessor to determine whether you have to update the server firmware. To download the latest level of server firmware and other code updates for the server, go to http://www.ibm.com/support/fixcentral/.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink. For details, see the information about thermal grease in the *Problem Determination and Service Guide*.

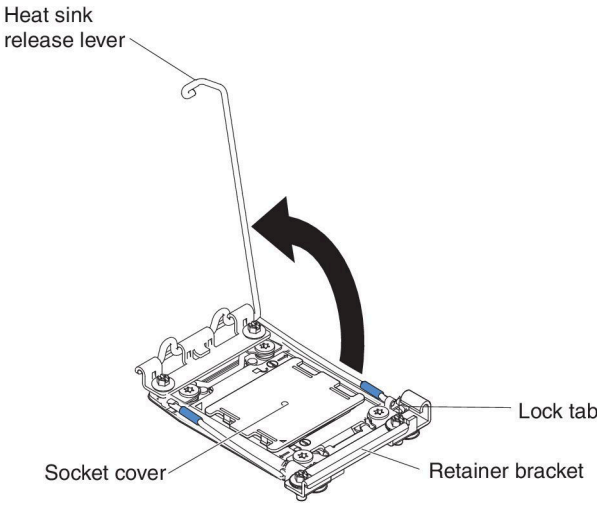
  Note: Removing the heat sink from the microprocessor destroys the even distribution of the thermal grease and requires replacing the thermal grease.
- To order an additional optional microprocessor, contact your IBM marketing representative or authorized reseller.

To install an additional microprocessor and heat sink, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables (see “Turning off the server” on page 28).

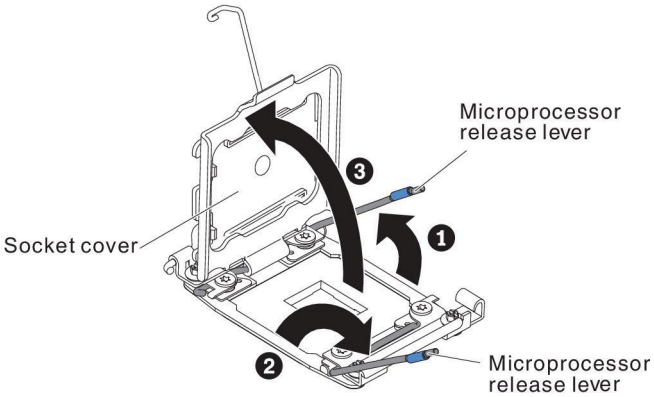
Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 40.

3. Remove the cover (see “Removing the cover” on page 50).
4. Remove the air baffle (see “Removing the air baffle” on page 51).
5. Locate microprocessor socket 2 on the system board (see “System-board internal connectors” on page 33).
6. Rotate the heat sink retention module release lever to the open position.

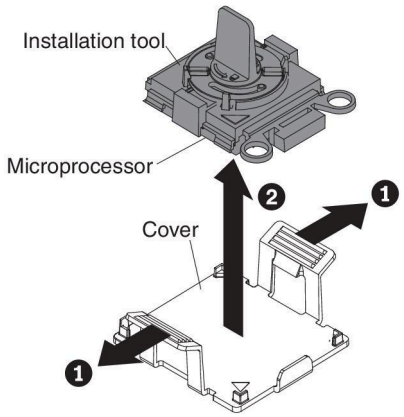


7. Open the microprocessor socket release levers and retainer:
   a. Identify which release lever is labeled as the first release lever to open and open it.
   b. Open the second release lever on the microprocessor socket.
   c. Open the microprocessor retainer.

   Attention: Do not touch the connectors on the microprocessor and the microprocessor socket.

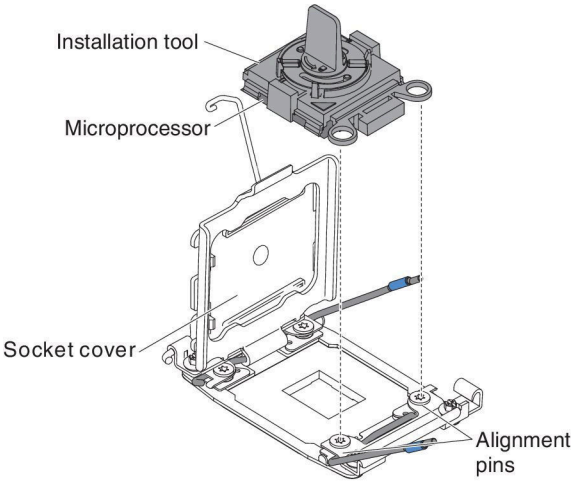


8. Install the microprocessor on the microprocessor socket:
   a. Touch the static-protective package that contains the new microprocessor to any *unpainted* on the chassis or any *unpainted* metal surface on any other grounded rack component; then, carefully remove the microprocessor from the package.
   b. Release the sides of the cover and remove the cover from the installation tool. The microprocessor is preinstalled on the installation tool.

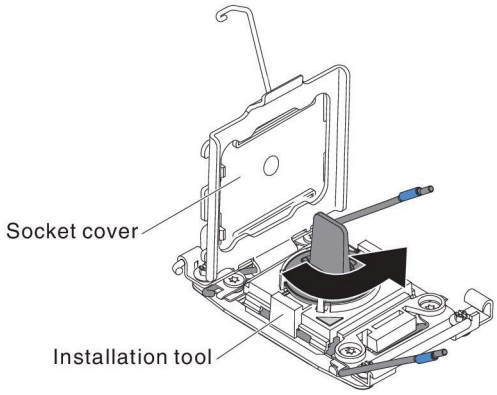


Note: Do not touch the microprocessor contacts. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

c. Align the installation tool with the microprocessor socket. The installation tool rests flush on the socket only if properly aligned.



d. Twist the handle on the microprocessor tool counterclockwise to insert the microprocessor into the socket. The microprocessor is keyed to ensure that the microprocessor is installed correctly. The microprocessor rests flush on the socket only if properly installed.

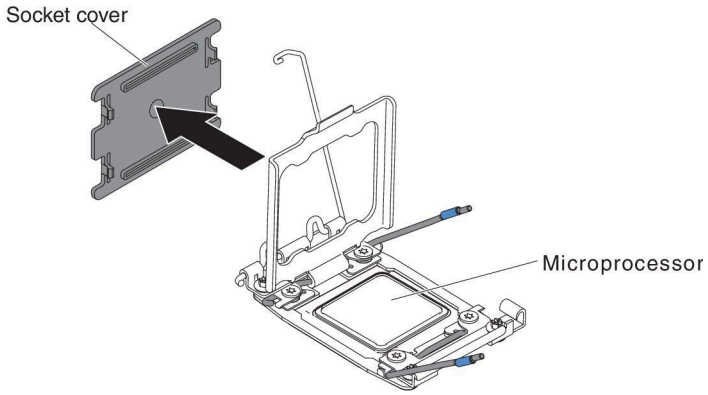


Attention:

- Do not press the microprocessor into the socket.

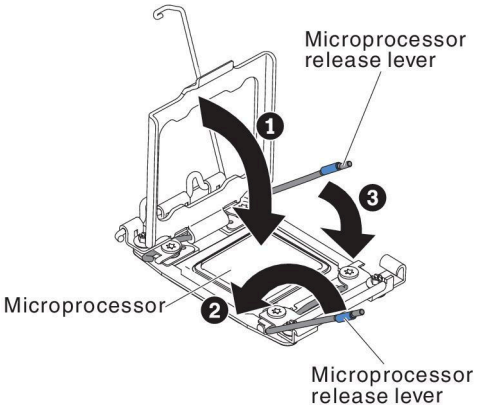
- Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the microprocessor retainer.
- Do not touch the thermal material on the bottom of the heat sink or on top of the microprocessor. Touching the thermal material will contaminate it.

9. Remove the microprocessor socket dust cover, tape, or label from the surface of the microprocessor socket, if one is present. Store the socket cover in a safe place.



Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 40.

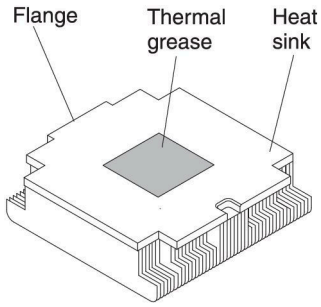
10. Close the microprocessor socket release levers and retainer:
    a. Close the microprocessor retainer on the microprocessor socket.
    b. Identify which release lever is labeled as the first release lever to close and close it.
    c. Close the second release lever on the microprocessor socket.



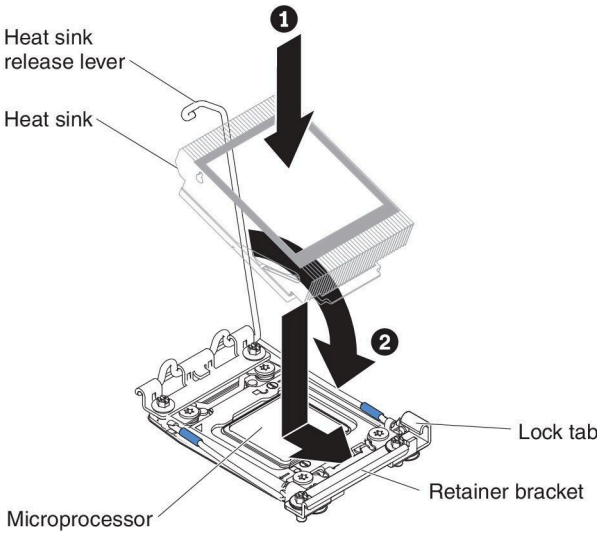
11. Install the heat sink:

Attention:

- Do not set down the heat sink after you remove the plastic cover.
- Do not touch the thermal grease on the bottom of the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it. See “Thermal grease” for more information.



a. Remove the plastic protective cover from the bottom of the heat sink.
b. Position the heat sink over the microprocessor. The heat sink is keyed to assist with proper alignment.
c. Align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down.
d. Press firmly on the heat sink.
e. Rotate the heat sink retention module release lever to the closed position and hook it underneath the lock tab.



12. If you installed the second microprocessor, install the fourth and sixth fans (see “Installing a hot-swap fan assembly” on page 93).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Thermal grease

The thermal grease must be replaced whenever the heat sink has been removed from the top of the microprocessor and is going to be reused or when debris is found in the grease.

When you are installing the heat sink on the same microprocessor that it was removed from, make sure that the following requirements are met:

- The thermal grease on the heat sink and microprocessor is not contaminated.
- Additional thermal grease is not added to the existing thermal grease on the heat sink and microprocessor.

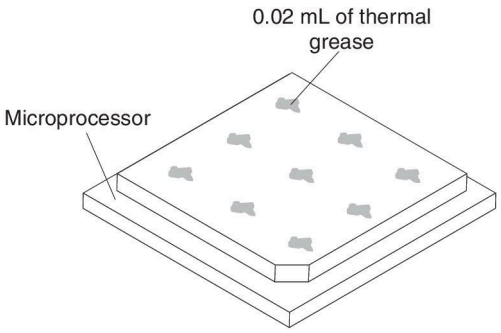
Notes:

- Read the safety information on page vii.
- Read the "Installation guidelines" on page 38.
- Read "Handling static-sensitive devices" on page 40.

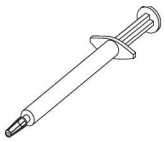
To replace damaged or contaminated thermal grease on the microprocessor and heat sink, complete the following steps:

1. Place the heat sink on a clean work surface.
2. Remove the cleaning pad from its package and unfold it completely.
3. Use the cleaning pad to wipe the thermal grease from the bottom of the heat sink.

   Note: Make sure that all of the thermal grease is removed.
4. Use a clean area of the cleaning pad to wipe the thermal grease from the microprocessor; then, dispose of the cleaning pad after all of the thermal grease is removed.



5. Use the thermal-grease syringe to place 9 uniformly spaced dots of 0.02 mL each on the top of the microprocessor. The outermost dots must be within approximately 5 mm of the edge of the microprocessor; this is to ensure uniform distribution of the grease.



   Note: If the grease is properly applied, approximately half of the grease will remain in the syringe.
6. Install the heat sink onto the microprocessor as described in 11 on page 83.

If you have other options to install or remove, do so now. Otherwise, go to "Completing the installation" on page 101.

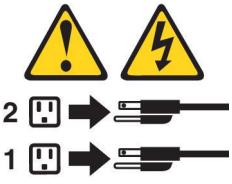
Installing a hot-swap ac power supply

The following notes describe the type of ac power supply that the server supports and other information that you must consider when you install a power supply:

- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Before you install an additional power supply or replace a power supply with one of a different wattage, you may use the IBM Power Configurator utility to determine current system power consumption. For more information and to download the utility, go to http://www-03.ibm.com/systems/bladecenter/resources/powerconfig.html.
- The server comes with one hot-swap 12-volt output power supply that connects to power supply bay 1. The input voltage is 100-127 V ac or 200-240 V ac auto-sensing.
- Power supplies in the server must be with the same power rating or wattage to ensure that the server will operate correctly. For example, you cannot mix 550-watt and 750-watt power supplies in the server.
- Power supply 1 is the default/primary power supply. If power supply 1 fails, you must replace the power supply with the same wattage immediately.
- You can order an optional power supply for redundancy.
- These power supplies are designed for parallel operation. In the event of a power-supply failure, the redundant power supply continues to power the system. The server supports a maximum of two power supplies.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



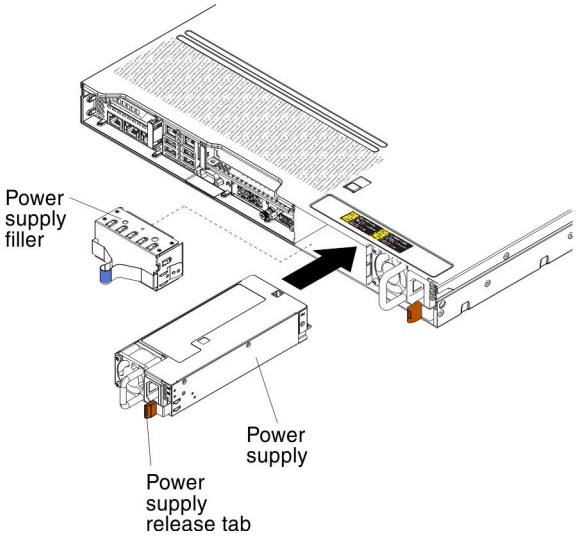
Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

To install a hot-swap ac power supply, complete the following steps:

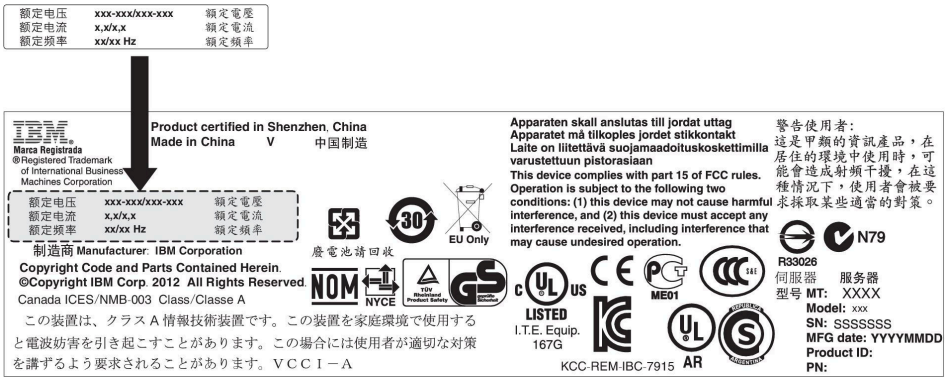
1. Read the safety information that begins vii and “Installation guidelines” on page 38.
2. Touch the static-protective package that contains the hot-swap power supply to any unpainted metal surface on the server; then, remove the power supply from the package and place it on a static-protective surface.
3. If you are installing a hot-swap power supply into an empty bay, remove the power-supply filler from the power-supply bay.



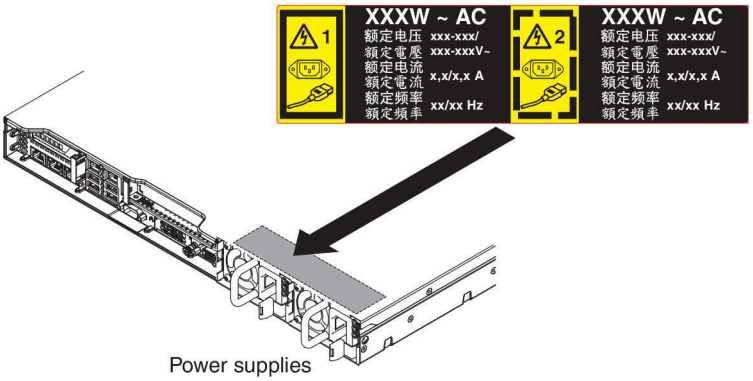
4. Grasp the handle on the rear of the power supply and slide the power supply forward into the power-supply bay until it clicks. Make sure that the power supply connects firmly into the power-supply connector.

   Attention: Do not mix 550-watt and 750-watt power supplies in the server.
5. Route the power cord through the handle and cable tie if any, so that it does not accidentally become unplugged.
6. Connect the power cord for the new power supply to the power-cord connector on the power supply.
7. Connect the other end of the power cord to a properly grounded electrical outlet.

8. Make sure that the ac power LED and the dc power LED on the ac power supply are lit, indicating that the power supply is operating correctly. The two green LEDs are to the right of the power-cord connector.
9. If you are replacing a power supply with one of a different wattage in the server, apply the new power information label provided over the existing power information label on the server. Power supplies in the server must be with the same power rating or wattage to ensure that the server will operate correctly.



10. If you are adding a power supply to the server, attach the redundant power information label that comes with this option on the server cover near the power supplies.



11. (IBM Business Partners only) Restart the server. Confirm that it starts correctly and recognizes the newly installed devices, and make sure that no error LEDs are lit.
12. (IBM Business Partners only) Complete the additional steps in “Instructions for IBM Business Partners” on page 31.

Installing a hot-swap dc power supply

The following notes describe the type of ac power supply that the server supports and other information that you must consider when you install a power supply:

- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Before you install an additional power supply or replace a power supply with one of a different wattage, you may use the IBM Power Configurator utility to determine current system power consumption. For more information and to download the utility, go to http://www-03.ibm.com/systems/bladecenter/resources/powerconfig.html.

- The server comes with one hot-swap 12-volt output power supply that connects to power supply bay 1. The input voltage is -48 V dc or -60 V dc auto-sensing.
- Before you install a dc power supply in the server, you must remove all ac power supplies. Do not use both ac and dc power supplies in the same server. Install up to two dc power supplies or up to two ac power supplies, but not a combination.
- Power supply 1 is the default/primary power supply. If power supply 1 fails, you must replace the power supply with the same wattage immediately.
- You can order an optional power supply for redundancy.
- These power supplies are designed for parallel operation. In the event of a power-supply failure, the redundant power supply continues to power the system. The server supports a maximum of two power supplies.
- It is the customer's responsibility to supply the necessary power cable.

  To reduce the risk of electric shock or energy hazards:

  – **Use a circuit breaker that is rated at 25 amps.**

  – **Use 2.5 mm^2 (12 AWG) at 90° C copper wire.**

  – **Torque the wiring-terminal screws to 0.50 ~ 0.60 newton-meters (4.43 ~ 5.31 inch-pounds).**

  For more information, see Statement 34 on page 91.
- If the power source requires ring terminals, you must use a crimping tool to install the ring terminals to the power cord wires. The ring terminals must be UL approved and must accommodate the wire that is described in the above-mentioned note .

Statement 29:

CAUTION: This equipment is designed to permit the connection of the earthed conductor of the dc supply circuit to the earthing conductor at the equipment.

This equipment is designed to permit the connection of the earthed conductor of the dc supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions must be met:

- This equipment shall be connected directly to the dc supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the dc supply system earthing electrode conductor is connected.
- This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same dc supply circuit and the earthing conductor, and also the point of earthing of the dc system. The dc system shall not be earthed elsewhere.
- The dc supply source shall be located within the same premises as this equipment.
- Switching or disconnecting devices shall not be in the earthed circuit conductor between the dc source and the point of connection of the earthing electrode conductor.

Statement 31:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

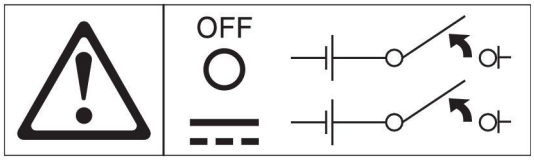
To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded power source.**
- **Connect to properly wired power sources any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached ac power cords, dc power sources, network connections, telecommunications systems, and serial cables before you open the device covers, unless you are instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when you install, move, or open covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn OFF all power sources and equipment that is to be attached to this product. 2. Attach signal cables to the product. 3. Attach power cords to the product. • For ac systems, use appliance inlets. • For dc systems, ensure correct polarity of -48 V dc connections: RTN is + and -48 V dc is -. Earth ground should use a two-hole lug for safety. 4. Attach signal cables to other devices. 5. Connect power cords to their sources. 6. Turn ON all the power sources.	1. Turn OFF all power sources and equipment that is to be attached to this product. • For ac systems, remove all power cords from the chassis power receptacles or interrupt power at the ac power distribution unit. • For dc systems, disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the dc cables. 2. Remove the signal cables from the connectors. 3. Remove all cables from the devices.

Statement 33:

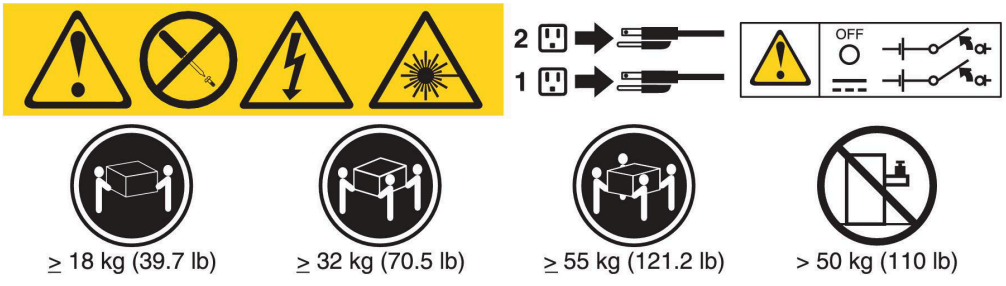
CAUTION:
This product does not provide a power-control button. Turning off blades or removing power modules and I/O modules does not turn off electrical current to the product. The product also might have more than one power cord. To remove all electrical current from the product, make sure that all power cords are disconnected from the power source.



Statement 34:

CAUTION:
To reduce the risk of electric shock or energy hazards:

- **This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and IEC 60950-1, First Edition, The Standard for Safety of Information Technology Equipment.**
- **Connect the equipment to a properly grounded safety extra low voltage (SELV) source. A SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).**
- **Incorporate a readily available approved and rated disconnect device in the field wiring.**
- **See the specifications in the product documentation for the required circuit-breaker rating for branch circuit overcurrent protection.**
- **Use copper wire conductors only. See the specifications in the product documentation for the required wire size.**
- **See the specifications in the product documentation for the required torque values for the wiring-terminal screws.**

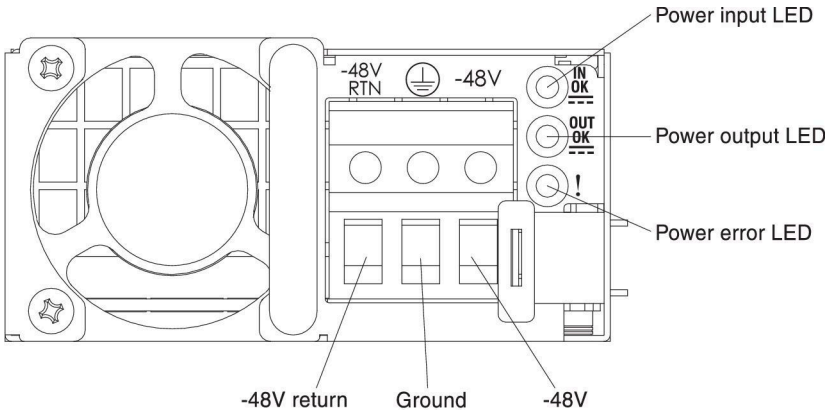


Important: Be sure to read the multilingual safety instructions on the CD that comes with the server before you use the product.

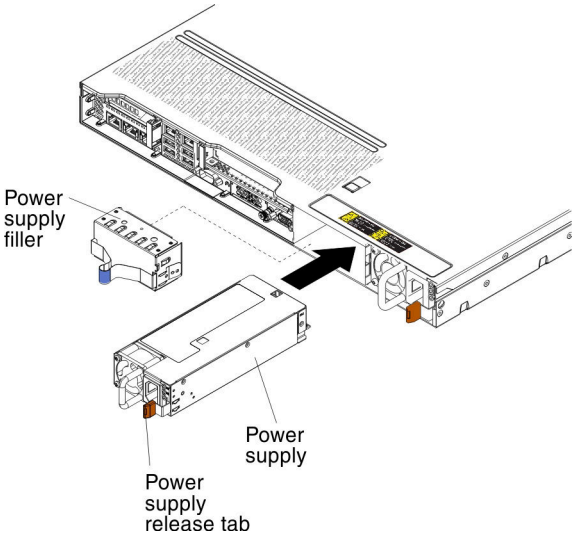
To install a hot-swap dc power supply, complete the following steps:

Attention: Only trained service personnel other than IBM service technicians are authorized to install and remove the -48 volt dc power supply, and make the connections to and disconnections from the -48 volt dc power source. IBM service technicians are not certified or authorized to install or remove the -48 volt power cable. The customer is responsible for ensuring that only trained service personnel install or remove the -48 volt power cable.

1. Read the safety information that begins vii and “Installation guidelines” on page 38.
2. Touch the static-protective package that contains the hot-swap power supply to any unpainted metal surface on the server; then, remove the power supply from the package and place it on a static-protective surface.
3. Turn off the circuit breaker for the dc power source to which the new power supply will be connected. Disconnect the power cord from the dc power source.
4. Attach the dc power cable to the new power supply.

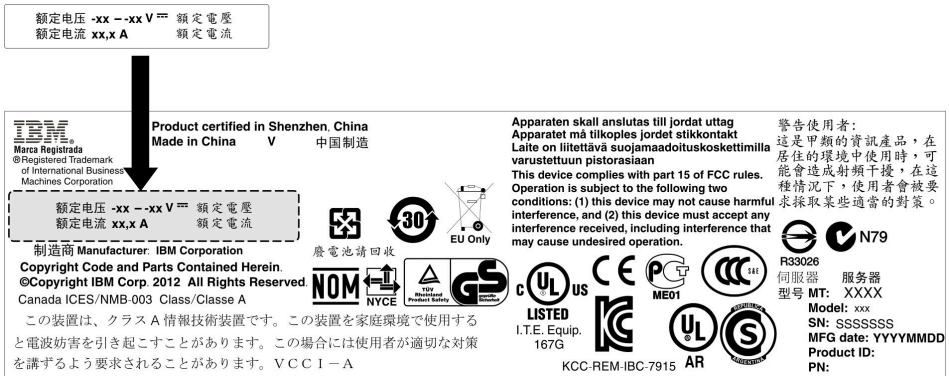


5. If you are installing a hot-swap power supply into an empty bay, remove the power-supply filler from the power-supply bay.



6. Grasp the handle on the rear of the power supply and slide the power supply forward into the power-supply bay until it clicks. Make sure that the power supply connects firmly into the power-supply connector.

7. Route the power cord through the handle and cable tie if any, so that it does not accidentally become unplugged.
8. Connect the power cord for the new power supply to the power-cord connector on the power supply.
9. Connect the other ends of the dc power cable to the dc power source. Cut the wires to the correct length, but do not cut them shorter than 150 mm (6 inch). If the power source requires ring terminals, you must use a crimping tool to install the ring terminals to the power cord wires. The ring terminals must be UL approved and must accommodate the wires that are described in note 89. The minimum nominal thread diameter of a pillar or stud type of terminal must be 4 mm; for a screw type of terminal the diameter must be 5.0 mm.
10. Turn on the circuit breaker for the dc power source to which the new power supply is connected.
11. Make sure that the green power LEDs on the power supply are lit, indicating that the power supply is operating correctly.
12. If you are replacing a power supply with one of a different wattage in the server, apply the new power information label provided over the existing power information label on the server. Power supplies in the server must be with the same power rating or wattage to ensure that the server will operate correctly.



13. If you are adding a power supply to the server, attach the redundant power information label that comes with this option on the server cover near the power supplies.

14. (IBM Business Partners only) Restart the server. Confirm that it starts correctly and recognizes the newly installed devices, and make sure that no error LEDs are lit.
15. (IBM Business Partners only) Complete the additional steps in “Instructions for IBM Business Partners” on page 31.

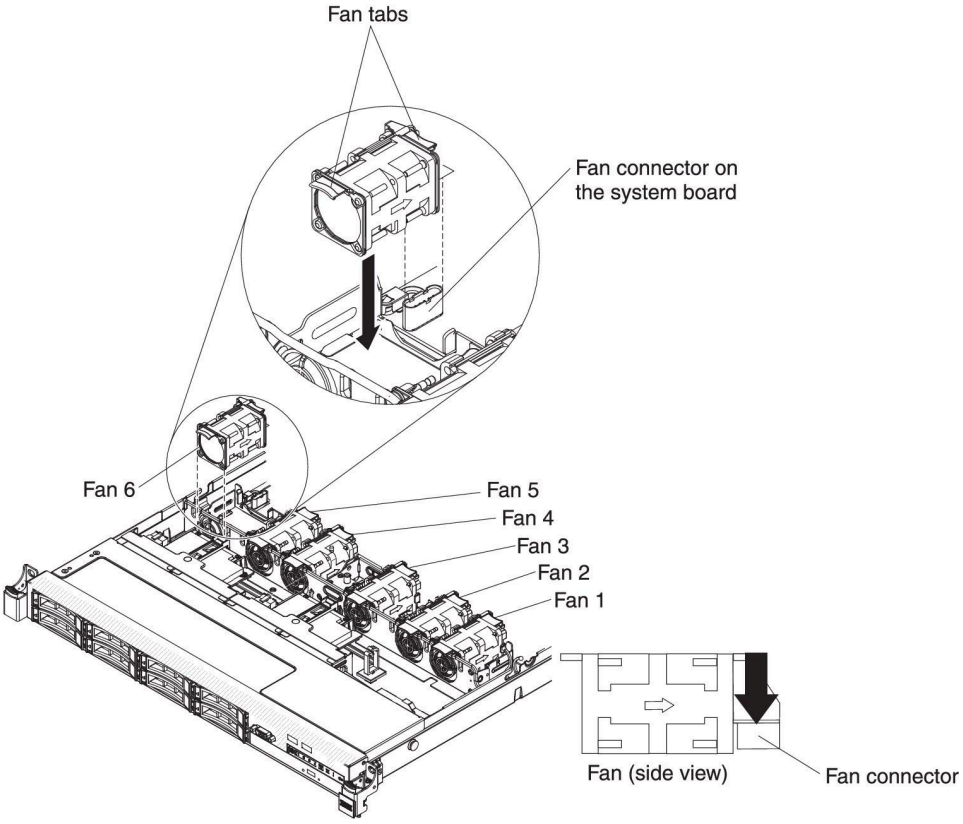
Installing a hot-swap fan assembly

The server comes standard with four dual-motor hot-swap cooling fans. When there is one microprocessor installed, install fan 1, 2, 3, and 5 for proper cooling.

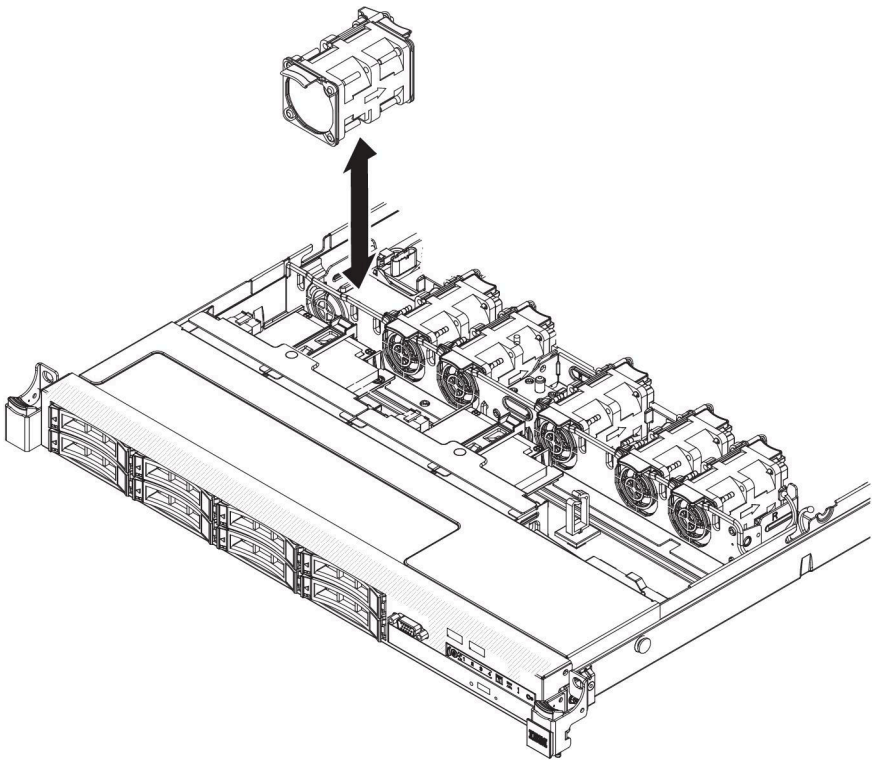
Attention: To ensure proper operation, replace a failed hot-swap fan within 30 seconds.

To install an additional hot-swap fan, complete the following steps:

1. Read the safety information that begins vii and “Installation guidelines” on page 38.
2. Remove the cover (see “Removing the cover” on page 50).
3. Remove the fan filler panel (if it has not been removed already). Keep the filler panel in a safe place.
4. Touch the static-protective package that contains the new fan to any unpainted metal surface on the server. Then, remove the new fan from the package.



5. Orient the fan over the fan slot in the fan assembly bracket so that the fan connector aligns with the connector on the system board.



6. Insert the fan into the fan slot in the fan assembly bracket and press it down until it is seated correctly in the slot and the fan connector is seated correctly in the connector on the system board.

   Note: Make sure that the newly-installed fan aligns horizontally with other correctly-seated fans for proper installation.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 101.

Installing the optional dual-port network adapter

You can purchase one of the following dual-port network adapters to add two additional network ports in the server. To order a dual-port network adapter option, contact your IBM marketing representative or authorized reseller.

Table 12. Supported dual-port network adapters on the network connector

Dual-port network adapter	Option part number	FRU part number	Remark
Mellanox ConnectX-3 dual-port QDR/FDR10 mezz card	90Y6338	90Y4956	
Qlogic dual-port 10GbE SFP+ Embedded VFA	90Y6454	90Y5099	Two microprocessors installed required.
Emulex dual-port 10GbE SFP+ Embedded VFA III	90Y6456	90Y5100	
Dual-port FDR embedded adapter	00D4143	90Y6606	

The following notes describe the types of adapters that the server supports and other information that you must consider when you install an adapter:

- To configure network adapters, complete the following steps:
  1. From the Setup utility main menu (see “Using the Setup utility” on page 109), select **System Settings** → **Network**.
  2. From the **Network Device List**, select **one network adapter**.

     Note: You might need to enter each item (displaying MAC address) to see detailed information.
  3. Press Enter to configure the network adapter settings.
- To convert the NIC/iSCSI/FCoE for Emulex Dual Port 10GbE SFP+ Embedded VFA III, complete the following steps:
  1. From the Setup utility main menu (see “Using the Setup utility” on page 109), select **System Settings** and press Enter.
  2. Select **Network** and press Enter.
  3. From the **Network Device List**, select **Emulex network adapter**.

     Note: You might need to enter each item (displaying MAC address) to see detailed information.
  4. Press Enter to configure Emulex network adapter, select **Personality** and press Enter to change the settings.
     - NIC
     - iSCSI (enabled after FoD installed)
     - FCoE (enabled after FoD installed)
- To download the latest version of drivers for iSCSI and FCoE from the IBM website, complete the following steps:
  1. Go to http://www.ibm.com/support/fixcentral/.
  2. From the **Product support**, select **System x**.
  3. From the **Product family** menu, select **System x3550 M4** and your machine type.
  4. From the **Operating system** menu, select your operating system, and then click **Search** to display the available drivers.
  5. Download the latest version of drivers.
     - Emulex iSCSI Device Driver for Windows 2008
     - Emulex FCoE Device Driver for Windows 2008

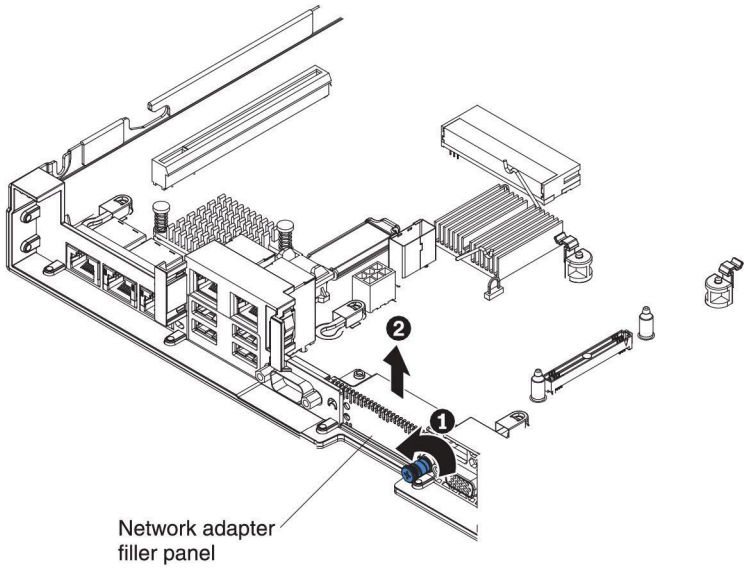
  Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is described in this document.
- Port 0 on the Emulex Dual Port 10GbE SFP+ Embedded VFA III can be configured as shared system management.
- When the server is in standby mode, both ports on the Emulex Dual Port 10GbE SFP+ Embedded VFA III function at 100M connection speed with Wake on LAN feature.

The Emulex Dual Port 10GbE SFP+ Embedded VFA III is automatically disabled if one of the following errors occurs:

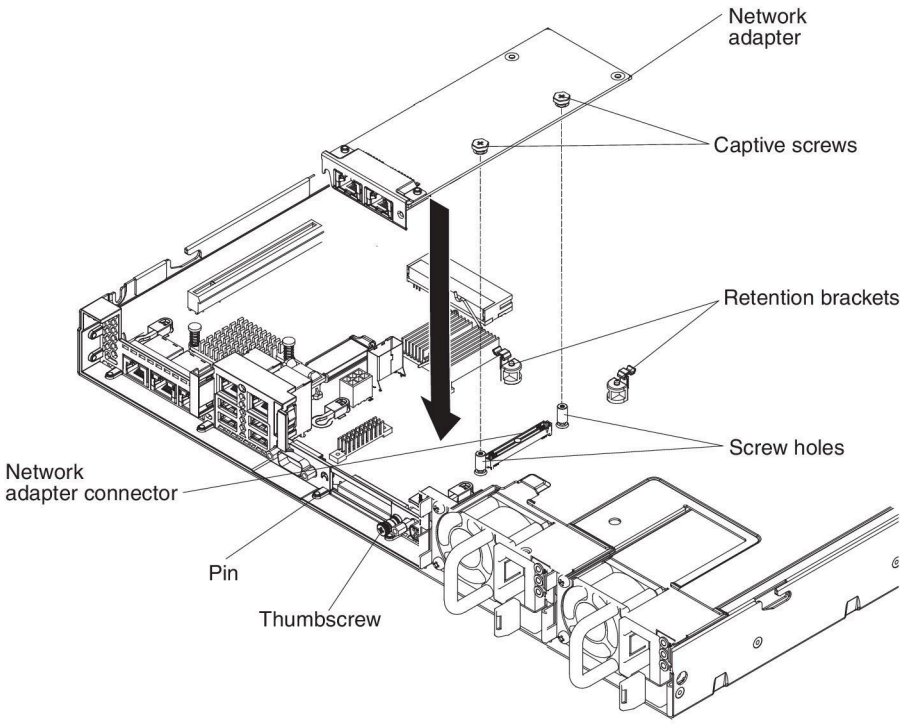
- An error log indicates a temperature warning for the Ethernet adapter.
- All power supplies are removed or the server is disconnected from the power source.

To install the network adapter, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the cover (see “Removing the cover” on page 50).
4. Remove the PCI riser-card assembly (if installed) from PCI riser connector 2 (see “Replacing a PCI riser-card assembly” on page 65).
5. Remove the adapter filler panel on the rear of the chassis (if it has not been removed already).



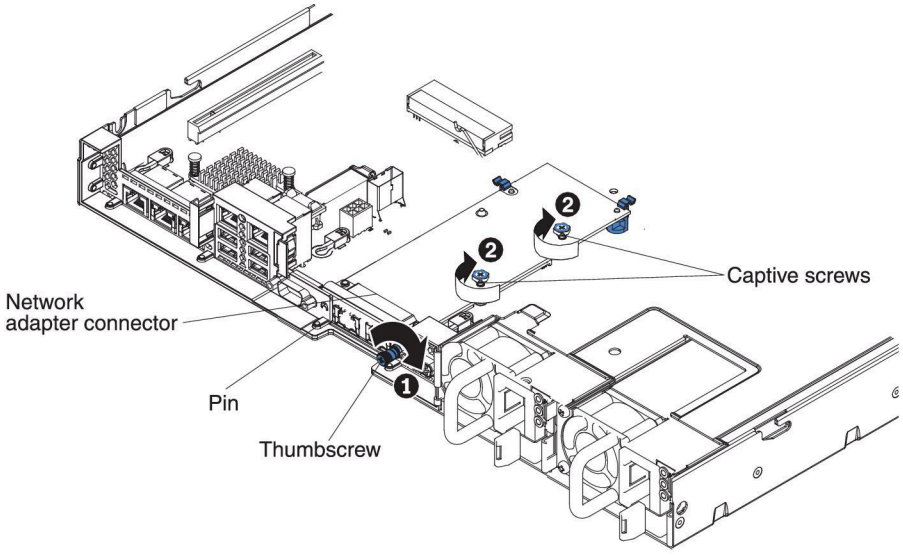
6. Touch the static-protective package that contains the new adapter to any unpainted metal surface on the server. Then, remove the adapter from the package.
7. Align the adapter so that the port connectors on the adapter line up with the pin and thumbscrew on the chassis; then, align the connector of the adapter with the adapter connector on the system board.



8. Press the adapter firmly until the pin, standoffs, and retention brackets engage the adapter. Make sure the adapter is securely seated on the connector on the system board.

   Attention: Make sure the port connectors on the adapter are aligned properly with the chassis on the rear of the server. An incorrectly seated adapter might cause damage to the system board or the adapter.

9. Fasten the thumbscrew on the rear side of the chassis.



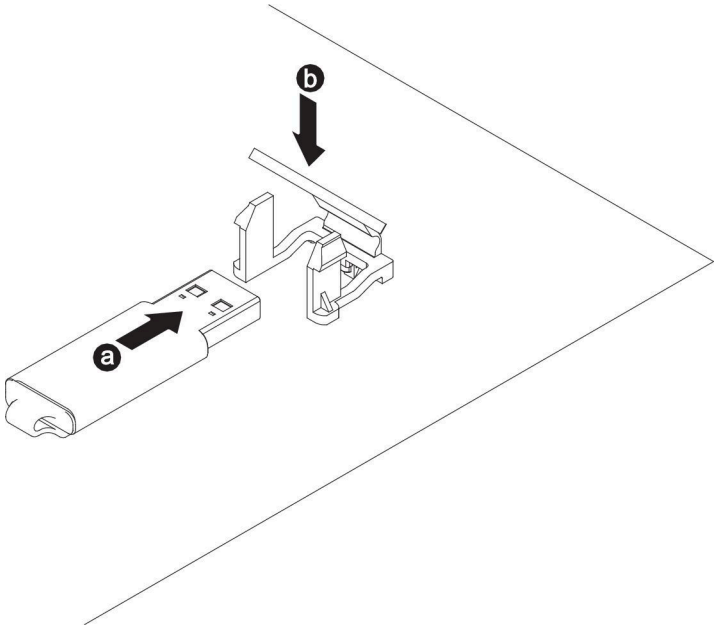
10. Fasten the two captive screws on the network adapter.
11. Reinstall the PCI riser-card assembly in PCI riser connector 2 if you have removed it previously (see “Replacing a PCI riser-card assembly” on page 65).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

Installing a USB embedded hypervisor flash device

To install a hypervisor flash device, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the cover (see “Removing the cover” on page 50).
4. Install the flash device:



   a. Align the flash device with the connector on the system board and push it into the USB connector until it is firmly seated.
   b. Press down on the retention latch to lock the flash device into the USB connector.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 101.

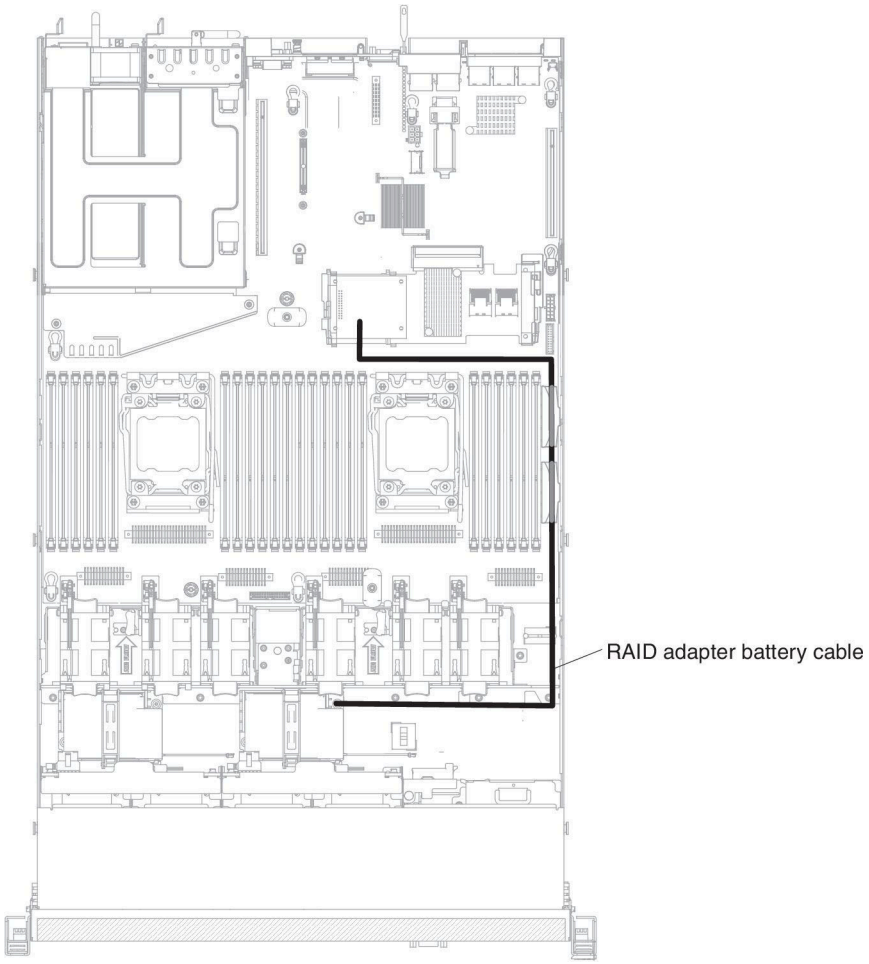
Installing a RAID adapter battery remotely in the server

When you install any RAID adapter that comes with batteries, it is sometimes necessary to install the batteries in another location in the server to prevent the batteries from overheating. Depending on your server model, a battery must be installed remotely near the optical drive cage or the backplane. The 2.5-inch server models support up to two batteries.

To install a RAID adapter battery in the server, complete the following steps:

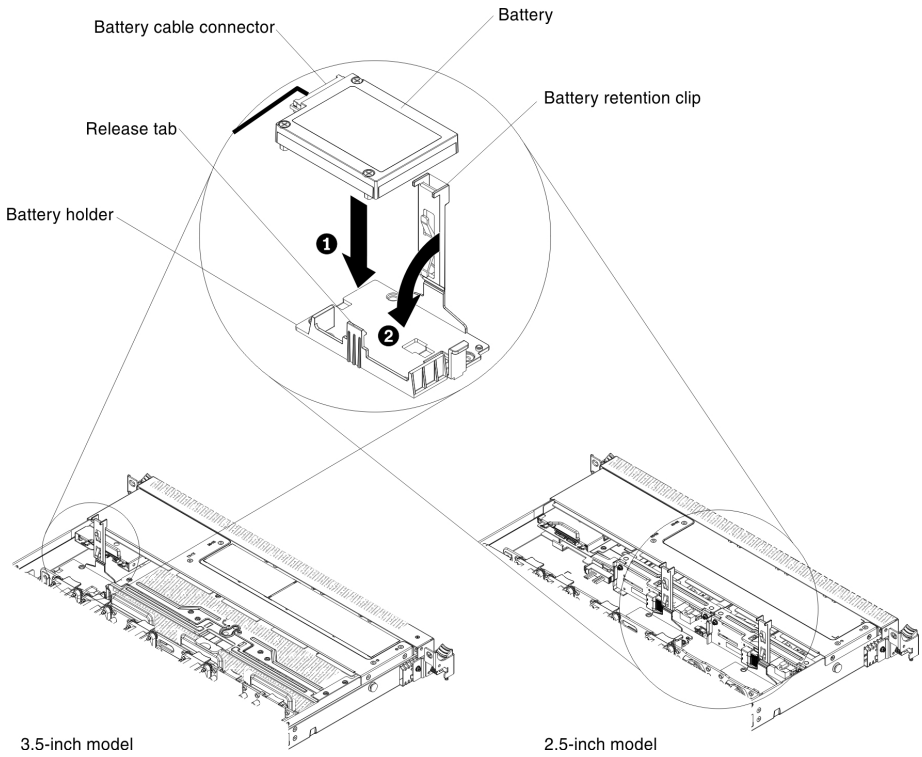
1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect all power cords and external devices.
3. Remove the cover (see “Removing the cover” on page 50).

4. Install the ServeRAID adapter on the system board (see “Installing a ServeRAID SAS/SATA controller” on page 71) or install the ServeRAID adapter on the riser card and install the riser-card assembly in the server (see “Replacing a PCI riser-card assembly” on page 65).
5. Connect one end of the battery cable to the RAID adapter battery connector.
6. Route the remote battery cable along the chassis.



Attention: Make sure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.

7. Install the battery:
   a. Align the battery cable connector with the slot on the battery holder. Place the battery into the battery holder and make sure that the battery holder engages the battery securely.



Note: The positioning of the remote battery depends on the type of the remote batteries that you install.

b. Connect the other end of the battery cable to the battery cable connector on the battery.

c. Lower and press down on the retention clip until it snaps in place to hold the battery firmly in place.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation."

Completing the installation

To complete the installation, complete the following steps:

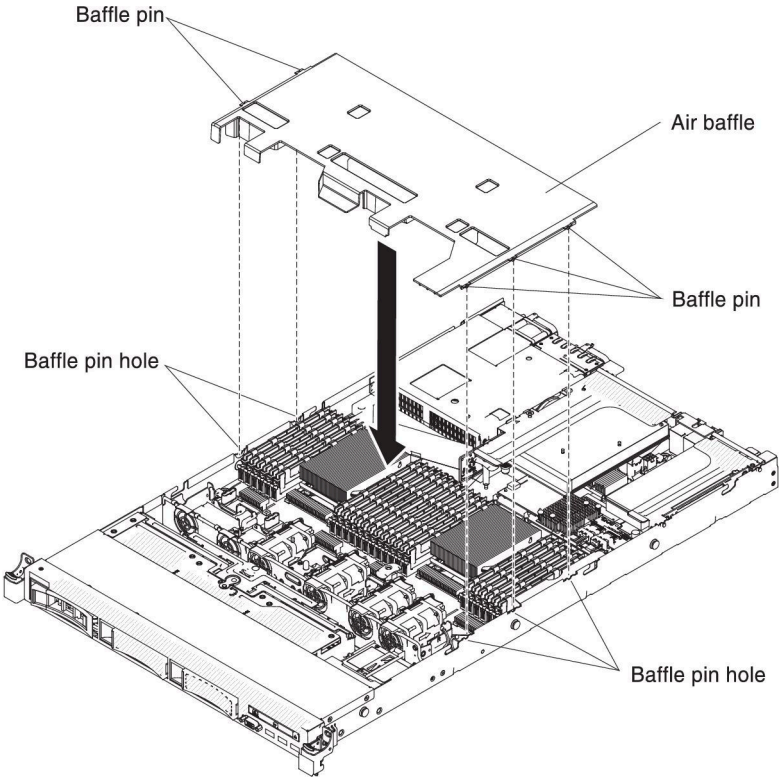
1. If you removed the air baffle, reinstall it (see "Replacing the air baffle" on page 102).
2. If you removed the server cover, replace it (see "Replacing the cover" on page 102).
3. Install the server in the rack cabinet (see the *Rack Installation Instructions* that come with the server for instructions).
4. Reconnect the cables and power cords (see "Connecting the cables" on page 103).
5. Update the server configuration (see "Updating the server configuration" on page 104).
6. Slide the server back into the rack, if necessary.
7. Start the server. Confirm that it starts correctly and recognizes the newly installed devices, and make sure that no error LEDs are lit.
8. (IBM Business Partners only) Complete the additional steps in "Instructions for IBM Business Partners" on page 31.

Replacing the air baffle

To replace the air baffle (if it has been removed), complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 38.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables (see “Turning off the server” on page 28).
3. Align the air baffle pins with the baffle pin holes on both sides of the chassis; then, lower the air baffle into the server. Press the air baffle down until it is securely seated.

   Note: Close the retaining clip on each end of the DIMM connector before installing the air baffle for proper cooling.

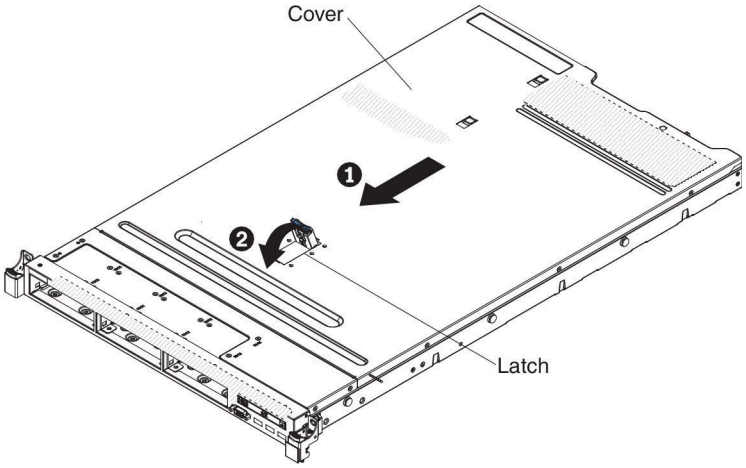


Replacing the cover

To replace the server cover, complete the following steps:

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server. Also, make sure that all internal cables are correctly routed.

   Important: Before you slide the cover forward, make sure that all the tabs on the front, rear, and side of the cover engage the chassis correctly. If all the tabs do not engage the chassis correctly, it will be very difficult to remove the cover later.
2. Position the cover on top of the server.
3. Slide the cover toward the front of the server.
4. Make sure that the cover correctly engages all the inset tabs on the server.
5. Press down the blue latch on the top (in the center of the front of the server) of the cover.



6. Slide the server all the way into the rack until it latches.

Connecting the cables

The following illustrations show the locations of the input and output connectors on the front of the server.

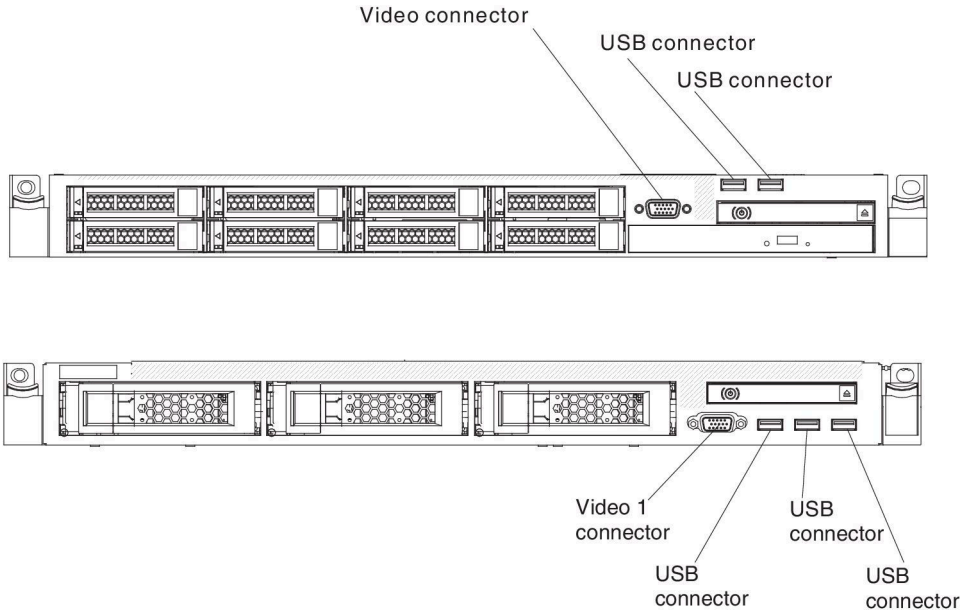


Figure 3. Front of server

The following illustration shows the locations of the input and output connectors on the rear of the server.

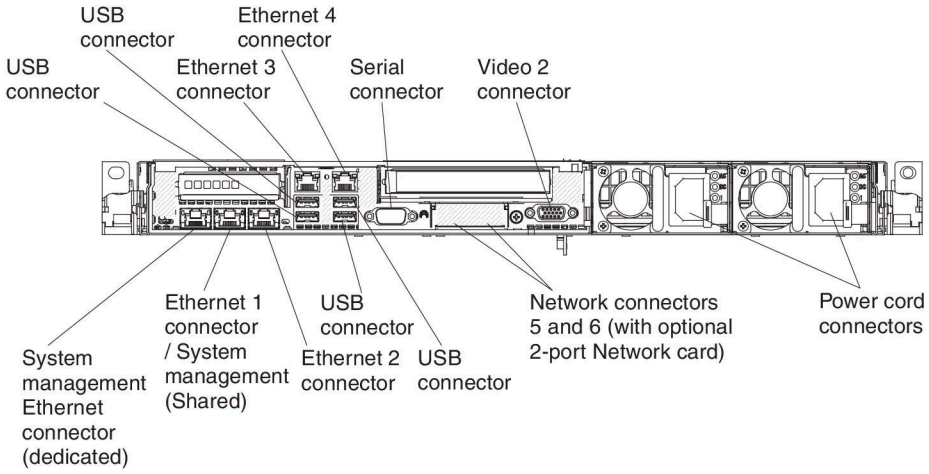


Figure 4. Rear of server

You must turn off the server before you connect or disconnect cables.

See the documentation that comes with any external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.

Updating the server configuration

When you start the server for the first time after you add or remove a device, you might receive a message that the configuration has changed. The Setup utility starts automatically so that you can save the new configuration settings.

Some optional devices have device drivers that you must install. For information about installing device drivers, see the documentation that comes with each device.

If the server has an optional RAID adapter and you have installed or removed a hard disk drive, see the documentation that comes with the RAID adapter for information about reconfiguring the disk arrays.

For information about configuring the integrated Gigabit Ethernet controller, see “Configuring the Ethernet controller” on page 119.

Chapter 3. Configuring the server

The following configuration programs come with the server:

- **Setup utility**

  The UEFI (formerly BIOS) Setup Utility program is part of the basic input/output system firmware. Use it to change interrupt request (IRQ) settings, change the startup-device sequence, set the date and time, and set passwords. For information about using this program, see “Using the Setup utility” on page 109.

- **Boot Manager program**

  The Boot Manager program is part of the server firmware. Use it to override the startup sequence that is set in the Setup utility and temporarily assign a device to be first in the startup sequence. For more information about using this program, see “Using the Boot Manager” on page 115.

- **IBM *ServerGuide Setup and Installation* CD**

  The ServerGuide program provides software-setup tools and installation tools that are designed for the server. Use this CD during the installation of the server to configure basic hardware features, such as an integrated SAS/SATA controller with RAID capabilities, and to simplify the installation of your operating system. For information about using this CD, see “Using the ServerGuide Setup and Installation CD” on page 106.

- **Integrated Management Module II**

  Use the integrated management module II (IMM2) for configuration, to update the firmware and sensor data record/field replaceable unit (SDR/FRU) data, and to remotely manage a network. For information about using the IMM2, see “Using the integrated management module II” on page 115.

- **Remote presence capability and blue-screen capture**

  The remote presence and blue-screen capture feature are integrated into the Integrated Management Module II (IMM2). The Integrated Management Module Advanced Upgrade is required to enable the remote presence functions. When the optional Integrated Management Module Advanced Upgrade is installed in the server, it activates the remote presence functions. Without the Integrated Management Module Advanced Upgrade, you will not be able to access the network remotely to mount or unmount drives or images on the client system. However, you will still be able to access the web interface without the Integrated Management Module Advanced Upgrade. You can order the optional IBM Integrated Management Module Advanced Upgrade, if one did not come with your server. For more information about how to enable the remote presence function, see “Using the remote presence capability and blue-screen capture” on page 117.

- **VMware ESXi embedded hypervisor**

  The VMware ESXi embedded hypervisor is available on the server models that come with an installed USB embedded hypervisor flash device. The USB flash device is installed in the USB connector on the system board. Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. For more information about using the embedded hypervisor, see “Using the embedded hypervisor” on page 118.

- **Ethernet controller configuration**

  For information about configuring the Ethernet controller, see “Configuring the Ethernet controller” on page 119.

- **IBM Advanced Settings Utility (ASU) program**

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Use this program as an alternative to the Setup utility for modifying UEFI settings. Use the ASU program online or out of band to modify UEFI settings from the command line without the need to restart the server to access the Setup utility. For more information about using this program, see “IBM Advanced Settings Utility program” on page 120.

- **LSI Configuration Utility program**

  Use the LSI Configuration Utility program to configure the integrated SAS/SATA controller with RAID capabilities and the devices that are attached to it. For information about using this program, see “Configuring RAID arrays” on page 120.

  The following table lists the different server configurations and the applications that are available for configuring and managing RAID arrays.

Table 13. Server configuration and applications for configuring and managing RAID arrays

Server configuration	RAID array configuration (before operating system is installed)	RAID array management (after operating system is installed)
ServeRAID-H1110 adapter	LSI Utility (Setup utility, press Ctrl+C), ServerGuide, Human Interface Infrastructure (HII)	MegaRAID Storage Manager (MSM), SAS2IRCU (Command Line) Utility for Storage Management
ServeRAID-M1115 adapter	MegaRAID BIOS Configuration Utility (press Ctrl+H to start), pre-boot CLI (press Ctrl+P to start), ServerGuide, HII	MegaRAID Storage Manager (MSM), MegaCLI (Command Line Interface), and IBM Director
ServeRAID-M5110 adapter	MegaRAID BIOS Configuration Utility (press Ctrl+H to start), pre-boot CLI (press Ctrl+P to start), ServerGuide, HII	MegaRAID Storage Manager (MSM), MegaCLI, and IBM Director
ServeRAID-M5120 adapter	MegaRAID BIOS Configuration Utility (press Ctrl+H to start), pre-boot CLI (press Ctrl+P to start), ServerGuide, HII	MegaRAID Storage Manager (MSM), MegaCLI, and IBM Director

Notes:

1. For more information about the Human Interface Infrastructure (HII) and SAS2IRCU, go to http://www-947.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5088601.
2. For more information about the MegaRAID, go to http://www-947.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5073015.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides software setup tools and installation tools that are designed for your server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. Use this CD during the initial installation of the server to simplify the operating-system installations by providing updated device drivers and, in some cases, installing them automatically. To download the CD, go to http://www.ibm.com/support/entry/portal/docdisplay?lndocid=SERV-GUIDE and click **IBM Service and Support Site**.

Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is described in this document.

To start the *ServerGuide Setup and Installation* CD, complete the following steps:

1. Insert the CD, and restart the server. If the CD does not start, see "ServerGuide Problems" in the *Problem Determination and Service Guide* on the *System x Documentation* CD.
2. Follow the instructions on the screen to:
   a. Select your language.
   b. Select your keyboard layout and country.
   c. View the overview to learn about ServerGuide features.
   d. View the readme file to review installation tips for your operating system and adapter.
   e. Start the operating-system installation. You will need your operating-system CD.

The ServerGuide program has the following features:

- An easy-to-use interface
- Diskette-free setup, and configuration programs that are based on detected hardware
- ServeRAID Manager program, which configures your ServeRAID adapter
- Device drivers that are provided for your server model and detected hardware
- Operating-system partition size and file-system type that are selectable during setup

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

ServerGuide features

Features and functions can vary slightly with different versions of the ServerGuide program. To learn more about the version that you have, start the *ServerGuide Setup and Installation* CD and view the online overview. Not all features are supported on all server models.

The ServerGuide program requires a supported IBM server with an enabled startable (bootable) CD drive. In addition to the *ServerGuide Setup and Installation* CD, you must have your operating-system CD to install the operating system.

The ServerGuide program performs the following tasks:

- Sets system date and time
- Detects the RAID adapter or controller and runs the SAS/SATA RAID configuration program
- Checks the microcode (firmware) levels of a ServeRAID adapter and determines whether a later level is available from the CD
- Detects installed hardware options and provides updated device drivers for most adapters and devices
- Provides diskette-free installation for supported Windows operating systems
- Includes an online readme file with links to tips for your hardware and operating-system installation

Setup and configuration overview

When you use the *ServerGuide Setup and Installation* CD, you do not need setup diskettes. You can use the CD to configure any supported IBM server model. The setup program provides a list of tasks that are required to set up your server model. On a server with a ServeRAID adapter or SAS/SATA controller with RAID capabilities, you can run the SAS/SATA RAID configuration program to create logical drives.

Important: Before you install a legacy operating system (such as VMware) on a server with an LSI SAS controller, you must first complete the following steps:

1. Update the device driver for the LSI SAS controller to the latest level.
2. In the Setup utility, set **Legacy Only** as the first option in the boot sequence in the **Boot Manager** menu.
3. Using the LSI Configuration Utility program, select a boot drive.

For detailed information and instructions, go to https://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=MIGR-5083225.

Typical operating-system installation

The ServerGuide program can reduce the time it takes to install an operating system. It provides the device drivers that are required for your hardware and for the operating system that you are installing. This section describes a typical ServerGuide operating-system installation.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

1. After you have completed the setup process, the operating-system installation program starts. (You will need your operating-system CD to complete the installation.)
2. The ServerGuide program stores information about the server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.
3. The ServerGuide program presents operating-system partition options that are based on your operating-system selection and the installed hard disk drives.
4. The ServerGuide program prompts you to insert your operating-system CD and restart the server. At this point, the installation program for the operating system takes control to complete the installation.

Installing your operating system without using ServerGuide

If you have already configured the server hardware and you are not using the ServerGuide program to install your operating system, complete the following steps to download the latest operating-system installation instructions from the IBM website.

Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/supportportal/.
2. Under **Product support**, click **System x**.
3. From the menu on the left side of the page, click **System x support search**.
4. From the **Task** menu, select **Install**.
5. From the **Product family** menu, select **System x3550 M4**.

6. From the **Operating system** menu, select your operating system, and then click **Search** to display the available installation documents.

Using the Setup utility

Use the Unified Extensible Firmware Interface (UEFI), formerly BIOS, Setup Utility program to perform the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set the startup characteristics of the server and the order of startup devices
- Set and change settings for advanced hardware features
- View, set, and change settings for power-management features
- View and clear error logs
- Change interrupt request (IRQ) settings
- Resolve configuration conflicts

Starting the Setup utility

To start the Setup utility, complete the following steps:

1. Turn on the server.

   Note: Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active.

2. When the prompt `<F1> Setup` is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.
3. Select settings to view or change.

Setup utility menu choices

The following choices are on the Setup utility main menu for the UEFI. Depending on the version of the firmware, some menu choices might differ slightly from these descriptions.

- **System Information**

  Select this choice to view information about the server. When you make changes through other choices in the Setup utility, some of those changes are reflected in the system information; you cannot change settings directly in the system information. This choice is on the full Setup utility menu only.

  – **System Summary**

    Select this choice to view configuration information, including the ID, speed, and cache size of the microprocessors, machine type and model of the server, the serial number, the system UUID, and the amount of installed memory. When you make configuration changes through other options in the Setup utility, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

  – **Product Data**

    Select this choice to view the system-board identifier, the revision level or issue date of the firmware, the integrated management module and diagnostics code, and the version and date.

  This choice is on the full Setup utility menu only.

- **System Settings**

  Select this choice to view or change the server component settings.

  – **Adapters and UEFI Drivers**

    Select this choice to view information about the UEFI 1.10 and UEFI 2.0 compliant adapters and drivers installed in the server.

  – **Processors**

    Select this choice to view or change the processor settings.

  – **Memory**

    Select this choice to view or change the memory settings.

  – **Devices and I/O Ports**

    Select this choice to view or change assignments for devices and input/output (I/O) ports. You can configure the serial ports, configure remote console redirection, enable or disable integrated devices. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device).

  – **Power**

    Select this choice to view or change power capping to control consumption, processors, and performance states.

  – **Operating Modes**

    Select this choice to view or change the operating profile (performance and power utilization).

  – **Legacy Support**

    Select this choice to view or set legacy support.

    - **Force Legacy Video on Boot**

      Select this choice to force INT video support, if the operating system does not support UEFI video output standards.

    - **Rehook INT 19h**

      Select this choice to enable or disable devices from taking control of the boot process. The default is **Disable**.

    - **Legacy Thunk Support**

      Select this choice to enable or disable UEFI to interact with PCI mass storage devices that are non-UEFI compliant. The default is **Enable**.

    - **Infinite Boot Retry**

      Select this choice to enable or disable UEFI to infinitely retry the legacy boot order. The default is **Disable**.

    - **BBS Boot**

      Select this choice to enable or disable legacy boot in BBS manner. The default is **Enable**.

  – **System Security**

    Select this choice to view or configure Trusted Platform Module (TPM) support.

  – **Integrated Management Module**

    Select this choice to view or change the settings for the integrated management module.

    - **Power Restore Policy**

      Select this choice to set the mode of operation after the power lost.

    - **Commands on USB Interface**

Select this choice to enable or disable the Ethernet over USB interface on IMM. The default is **Enable**.

- **Network Configuration**

  Select this choice to view the system management network interface port, the IMM MAC address, the current IMM IP address, and host name; define the static IMM IP address, subnet mask, and gateway address, specify whether to use the static IP address or have DHCP assign the IMM2 IP address, save the network changes, and reset the IMM.

- **Reset IMM to Defaults**

  Select this choice to view or reset IMM to the default settings.

- **Reset IMM**

  Select this choice to reset IMM.

– **Recovery**

Select this choice to view or change the system recovery parameters.

- **POST Attempts**

  Select this choice to view or change the number of attempts to POST.

  • **POST Attempts Limit**

    Select this choice to view or change the Nx boot failure parameters.

- **System Recovery**

  Select this choice to view or change system recovery settings.

  • **POST Watchdog Timer**

    Select this choice to view or enable the POST watchdog timer.

  • **POST Watchdog Timer Value**

    Select this choice to view or set the POST loader watchdog timer value.

  • **Reboot System on NMI**

    Select this choice to enable or disable restarting the system whenever a nonmaskable interrupt (NMI) occurs. **Enable** is the default.

  • **Halt on Severe Error**

    Select this choice to enable or disable the system from booting into OS, displaying the POST event viewer whenever a severe error was detected. **Disable** is the default.

– **Storage**

Select this choice to view or change the storage device settings.

– **Network**

Select this choice to view or change the network device options, such as iSCSI.

– **Drive Health**

Select this choice to view the status of the controllers installed in the blade server.

• **Date and Time**

Select this choice to set the date and time in the server, in 24-hour format (*hour*:*minute*:*second*).

This choice is on the full Setup utility menu only.

• **Start Options**

Select this choice to view or change the start options, including the startup sequence, keyboard NumLock state, PXE boot option, and PCI device boot priority. Changes in the startup options take effect when you start the server.

The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. If the server has Wake on LAN hardware and software and the operating system supports Wake on LAN functions, you can specify a startup sequence for the Wake on LAN functions. For example, you can define a startup sequence that checks for a disc in the CD-RW/DVD drive, then checks the hard disk drive, and then checks a network adapter.

This choice is on the full Setup utility menu only.

- **Boot Manager**

  Select this choice to view, add, delete, or change the device boot priority, boot from a file, select a one-time boot, or reset the boot order to the default setting.

- **System Event Logs**

  Select this choice to enter the System Event Manager, where you can view the error messages in the system event logs. You can use the arrow keys to move between pages in the error log.

  The system event logs contain all event and error messages that have been generated during POST, by the systems-management interface handler, and by the system service processor. Run the diagnostic programs to get more information about error codes that occur. See the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for instructions for running the diagnostic programs.

  Important: If the system-error LED on the front of the server is lit but there are no other error indications, clear the IMM2 system-event log. Also, after you complete a repair or correct an error, clear the IMM2 system-event log to turn off the system-error LED on the front of the server.

  – **POST Event Viewer**

    Select this choice to enter the POST event viewer to view the POST error messages.

  – **System Event Log**

    Select this choice to view the system event log.

  – **Clear System Event Log**

    Select this choice to clear the system event log.

- **User Security**

  Select this choice to set, change, or clear passwords. See “Passwords” on page 113 for more information.

  This choice is on the full and limited Setup utility menu.

  – **Set Power-on Password**

    Select this choice to set or change a power-on password. For more information, see “Power-on password” on page 113 for more information.

  – **Clear Power-on Password**

    Select this choice to clear a power-on password. For more information, see “Power-on password” on page 113 for more information.

  – **Set Administrator Password**

    Select this choice to set or change an administrator password. An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu. If an administrator password is set, the full Setup utility menu is available only if you type the administrator password at the password prompt. For more information, see “Administrator password” on page 114.

  – **Clear Administrator Password**

Select this choice to clear an administrator password. For more information, see “Administrator password” on page 114.

- **Save Settings**

  Select this choice to save the changes that you have made in the settings.
- **Restore Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the previous settings.
- **Load Default Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the factory settings.
- **Exit Setup**

  Select this choice to exit from the Setup utility. If you have not saved the changes that you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Passwords

From the **User Security** menu choice, you can set, change, and delete a power-on password and an administrator password. The **User Security** choice is on the full Setup utility menu only.

If you set only a power-on password, you must type the power-on password to complete the system startup and to have access to the full Setup utility menu.

An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu. If you set only an administrator password, you do not have to type a password to complete the system startup, but you must type the administrator password to access the Setup utility menu.

If you set a power-on password for a user and an administrator password for a system administrator, you must type the power-on password to complete the system startup. A system administrator who types the administrator password has access to the full Setup utility menu; the system administrator can give the user authority to set, change, and delete the power-on password. A user who types the power-on password has access to only the limited Setup utility menu; the user can set, change, and delete the power-on password, if the system administrator has given the user that authority.

Power-on password

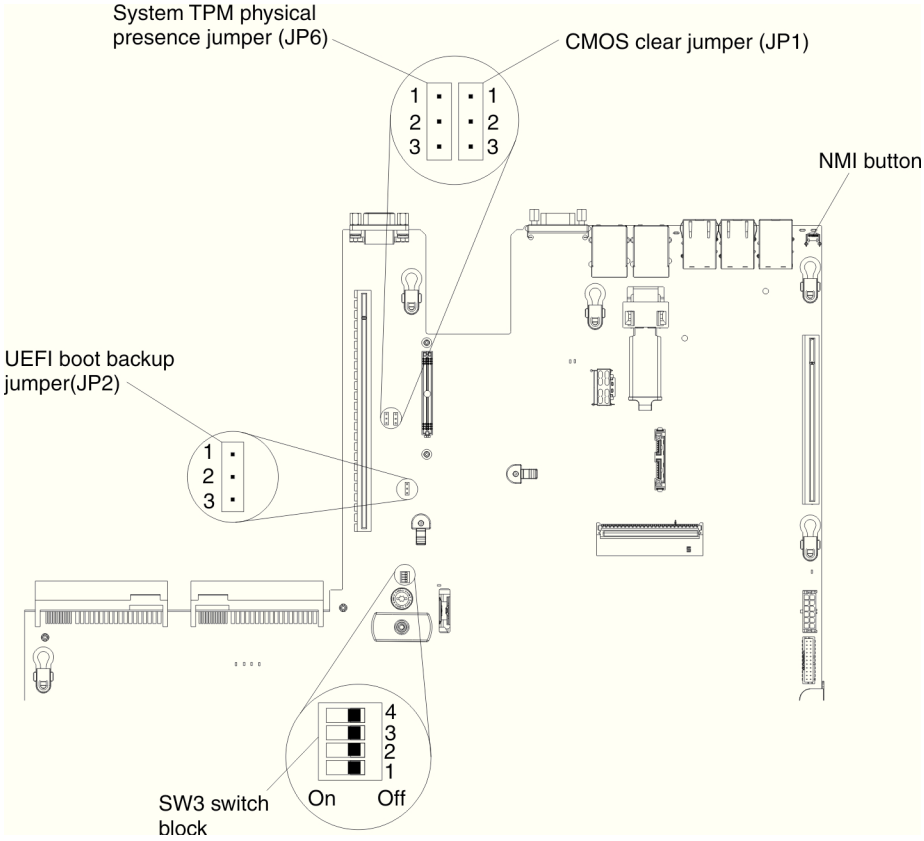
If a power-on password is set, when you turn on the server, you must type the power-on password to complete the system startup. You can use any combination of 6 - 20 printable ASCII characters for the password.

When a power-on password is set, you can enable the Unattended Start mode, in which the keyboard and mouse remain locked but the operating system can start. You can unlock the keyboard and mouse by typing the power-on password.

If you forget the power-on password, you can regain access to the server in any of the following ways:

- If an administrator password is set, type the administrator password at the password prompt. Start the Setup utility and reset the power-on password.
- Remove the battery from the server and then reinstall it. See the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for instructions for removing the battery.

- Change the position of the power-on password switch (enable switch 4 of the system board switch block (SW3) to bypass the power-on password check (see “System-board switches and jumpers” on page 35 for more information).



Attention: Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. See the safety information that begins on page vii. Do not change settings or move jumpers on any system-board switch or jumper block that is not shown in this document.

The default for all of the switches on switch block (SW3) is Off.

While the server is turned off, move switch 4 of the switch block (SW3) to the On position to enable the power-on password override. You can then start the Setup utility and reset the power-on password. You do not have to return the switch to the previous position.

The power-on password override switch does not affect the administrator password.

Administrator password

If an administrator password is set, you must type the administrator password for access to the full Setup utility menu. You can use any combination of 6 - 20 printable ASCII characters for the password.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

Using the Boot Manager

The Boot Manager program is a built-in, menu-driven configuration utility program that you can use to temporarily redefine the first startup device without changing settings in the Setup utility.

To use the Boot Manager program, complete the following steps:

1. Turn off the server.
2. Restart the server.
3. When the prompt `<F12> Select Boot Device` is displayed, press F12.
4. Use the Up arrow and Down arrow keys to select an item from the menu and press Enter.

The next time the server starts, it returns to the startup sequence that is set in the Setup utility.

Starting the backup server firmware

The system board contains a backup copy area for the server firmware. This is a secondary copy of the server firmware that you update only during the process of updating the server firmware. If the primary copy of the server firmware becomes damaged, use this backup copy.

To force the server to start from the backup copy, turn off the server; then, place the JP2 jumper in the backup position (pins 2 and 3).

Use the backup copy of the server firmware until the primary copy is restored. After the primary copy is restored, turn off the server; then, move the JP2 jumper back to the primary position (pins 1 and 2).

Using the integrated management module II

The integrated management module II (IMM2) is the second generation of the IMM. Unlike the first generation of IMM, the IMM2 has three levels of firmware: basic, standard, and premium. The level of IMM2 firmware in your server depends on the server platform. IMM2 basic firmware provides server management through the Intelligent Platform Management Interface (IPMI). IMM2 standard firmware provides basic functionality plus the ability to manage servers through other user interfaces, such as the web, Telnet, Secure Shell (SSH), and Simple Network Management Protocol (SNMP). IMM2 premium firmware provides standard functionality plus remote-presence capability.

Some servers that come with IMM2 basic or standard firmware might have an option to upgrade the IMM2 firmware to a higher level. If you add the service processor upgrade option to IMM2 basic firmware, the result is IMM2 standard functionality. If you add the remote presence upgrade option to IMM2 standard firmware, the result is IMM2 premium functionality.

Note: You cannot upgrade IMM2 basic firmware directly to IMM2 premium firmware by using the remote presence upgrade option. You must use the service processor upgrade option to upgrade to IMM2 standard firmware and then use the remote presence upgrade option to upgrade to IMM2 premium firmware.

For more information about the IMM2, see the *Integrated Management Module II User's Guide* at http://www-947.ibm.com/support/entry/portal/docdisplay?brand=5000008&lndocid=MIGR-5086346.

The IMM2 supports the following basic systems-management features:

- Environmental monitor with fan speed control for temperature, voltages, fan failure, and power supply failure.
- DIMM error assistance. The Unified Extensible Firmware Interface (UEFI) disables a failing DIMM that is detected during POST, and the IMM2 lights the associated system error LED and the failing DIMM error LED.
- System-event log (SEL).
- ROM-based IMM2 firmware flash updates.
- Auto Boot Failure Recovery (ABR).
- Nonmaskable interrupt (NMI) detection and reporting.
- Automatic Server Restart (ASR) when POST is not complete or the operating system hangs and the operating system watchdog timer times-out. The IMM2 might be configured to watch for the operating system watchdog timer and reboot the system after a timeout, if the ASR feature is enabled. Otherwise, the IMM2 allows the administrator to generate a nonmaskable interrupt (NMI) by pressing an NMI button on the system board for an operating-system memory dump. ASR is supported by IPMI.
- Intelligent Platform Management Interface (IPMI) Specification V2.0 and Intelligent Platform Management Bus (IPMB) support.
- Invalid system configuration (CNFG) LED support.
- Serial over LAN (SOL).
- PECI 2 support.
- Power/reset control (power-on, hard and soft shutdown, hard and soft reset, schedule power control).
- Alerts (in-band and out-of-band alerting, PET traps - IPMI style, SNMP, e-mail).
- Operating-system failure blue screen capture.
- Configuration save and restore.
- PCI configuration data.
- Boot sequence manipulation.

The IMM2 also provides the following remote server management capabilities through the OSA SMBridge management utility program:

- **Command-line interface (IPMI Shell)**

  The command-line interface provides direct access to server management functions through the IPMI 2.0 protocol. Use the command-line interface to issue commands to control the server power, view system information, and identify the server. You can also save one or more commands as a text file and run the file as a script.

- **Serial over LAN**

  Establish a Serial over LAN (SOL) connection to manage servers from a remote location. You can remotely view and change the UEFI settings, restart the server, identify the server, and perform other management functions. Any standard Telnet client application can access the SOL connection.

Obtaining the IP address for the IMM2

To access the web interface, you need the IP address for IMM2. You can obtain the IMM2 IP address through the Setup utility. The server comes with a default IP address for the IMM2 of 192.168.70.125. To locate the IP address, complete the following steps:

1. Turn on the server.

   Note: Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active.
2. When the prompt <F1> Setup is displayed, press F1. (This prompt is displayed on the screen for only a few seconds. You must press F1 quickly.) If you have set both a power-on password and an administrator password, you must type the administrator password to access the full Setup utility menu.
3. From the Setup utility main menu, select **System Settings**.
4. On the next screen, select **Integrated Management Module**.
5. On the next screen, select **Network Configuration**.
6. Find the IP address and write it down.
7. Exit from the Setup utility.

Logging on to the web interface

To log onto the web interface to use the remote presence functions, complete the following steps:

1. Open a web browser on a computer that connects to the server and in the **address** or **URL** field, type the IP address or host name of the IMM to which you want to connect.

   Note: The IMM2 defaults to DHCP. If a DHCP host is not available, the IMM2 assigns a static IP address of 192.168.70.125.
2. On the Login page, type the user name and password. If you are using the IMM for the first time, you can obtain the user name and password from your system administrator. All login attempts are documented in the event log.

   Note: The IMM2 is set initially with a user name of USERID and password of PASSW0RD (passw0rd with a zero, not the letter O). You have read/write access. You must change the default password the first time you log on.
3. On the Welcome page, type a timeout value (in minutes) in the field that is provided. The IMM2 will log you off of the web interface if your browser is inactive for the number of minutes that you entered for the timeout value.
4. Click **Continue** to start the session. The System Health page provides a quick view of the system status.

Using the remote presence capability and blue-screen capture

The remote presence and blue-screen capture features are integrated functions of the Integrated Management Module II (IMM2). When the optional IBM Integrated Management Module Advanced Upgrade is installed in the server, it activates the remote presence functions. The Integrated Management Module Advanced Upgrade is required to enable the integrated remote presence and blue-screen capture features. Without the Integrated Management Module Advanced Upgrade, you will not be able to access the network remotely to mount or unmount drives or images on the client system. However, you can still access the web interface without the upgrade.

After the Integrated Management Module Advanced Upgrade is installed in the server, it is authenticated to determine whether it is valid. If the key is not valid, you receive a message from the web interface (when you attempt to start the remote presence feature) indicating that the Integrated Management Module Advanced Upgrade is required to use the remote presence feature.

The remote presence feature provides the following functions:

- Remotely viewing video with graphics resolutions up to 1600 x 1200 at 75 Hz, regardless of the system state
- Remotely accessing the server, using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the IMM memory and mapping it to the server as a virtual drive

The blue-screen capture feature captures the video display contents before the IMM restarts the server when the IMM detects an operating-system hang condition. A system administrator can use the blue-screen capture to assist in determining the cause of the hang condition.

Enabling the remote presence feature

To enable the remote presence feature, complete the following steps:

1. Install the Integrated Management Module Advanced Upgrade.
2. Turn on the server.

   Note: Approximately 20 to 40 seconds after the server is connected to power, the power-control button becomes active.

For more information on Features on Demand (FoD), including instructions for automating the activation and installation of the activation key by using IBM ToolsCenter or IBM Systems Director, see the *IBM Features on Demand User's Guide* at http://www.ibm.com/systems/x/fod/ under the Help section.

Note: You have to reactivate the features after replacing the system board.

Using the embedded hypervisor

The VMware ESXi embedded hypervisor software is available on the optional IBM USB flash device with embedded hypervisor. Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. The USB flash device is required to activate the hypervisor functions.

To start using the embedded hypervisor functions, you must add the USB flash device to the startup sequence in the Setup utility.

To add the USB flash device to the startup sequence, complete the following steps:

1. Turn on the server.

   Note: Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active.
2. When the prompt `<F1> Setup` is displayed, press F1.
3. From the Setup utility main menu, select **Boot Manager**.

4. Select **Add Boot Option**; then, select **Generic Boot Option** and **Embedded Hypervisor**. Press Enter, and then select Esc.
5. Select **Change Boot Order** and then select **Change the order**. Use the Up arrow and Down Arrow keys to select Embedded Hypervisor and use the plus (+) and minus (-) keys to move Embedded Hypervisor in the boot order. When **Embedded Hypervisor** is in the correct location in the boot order, press Enter. Select **Commit Changes** and press Enter.
6. Select **Save Settings** and then select **Exit Setup**.

If the embedded hypervisor flash device image becomes corrupt, you can download the image from http://www-03.ibm.com/systems/x/os/vmware/esxi/.

For additional information and instructions, see VMware vSphere 4.1 Documentation at http://www.vmware.com/support/pubs/vs_pages/vsp_pubs_esxi41_e_vc41.html or the *VMware vSphere Installation and Setup Guide* at http://pubs.vmware.com/vsphere-50/topic/com.vmware.ICbase/PDF/vsphere-esxi-vcenter-server-50-installation-setup-guide.pdf.

Configuring the Ethernet controller

The Ethernet controllers are integrated on the system board. They provide an interface for connecting to a 10 Mbps, 100 Mbps, or 1 Gbps network and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in the server support auto-negotiation, the controllers detect the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operate at that rate and mode.

You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers.

To find device drivers and information about configuring the Ethernet controllers, go to http://www.ibm.com/supportportal/.

Enabling Features on Demand Ethernet software

You can activate the Features on Demand (FoD) software upgrade key for Fibre Channel over Ethernet (FCoE) and iSCSI storage protocols that is integrated in the integrated management module. For more information and instructions for activating the Features on Demand Ethernet software key, see the *IBM Features on Demand User's Guide*. To download the document, go to http://www.ibm.com/systems/x/fod/, log in, and click **Help**.

Enabling Features on Demand RAID software

Integrated into the integrated management module is a Features on Demand RAID software upgrade key that you can activate to get support for RAID levels 5 and 50 or 6 and 60 (depending on the Features on Demand key). For more information and instructions for activating the Features on Demand RAID software key, see the *IBM Features on Demand User's Guide*. To download the document, go to http://www.ibm.com/systems/x/fod/, log in, and click **Help**.

Configuring RAID arrays

Through the Setup utility, you can access utilities to configure RAID arrays. The specific procedure for configuring arrays depends on the RAID controller that you are using. For details, see the documentation for your RAID controller. To access the utility for your RAID controller, complete the following steps:

1. Turn on the server.

   Note: Approximately 10 seconds after the server is connected to power, the power-control button becomes active.
2. When prompted, <F1 Setup> is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.
3. Select **System Settings → Storage**.
4. Press Enter to refresh the list of device drivers.
5. Select the device driver for your RAID controller and press Enter.
6. Follow the instructions in the documentation for your RAID controller.

IBM Advanced Settings Utility program

The IBM Advanced Settings Utility (ASU) program is an alternative to the Setup utility for modifying UEFI settings. Use the ASU program online or out of band to modify UEFI settings from the command line without the need to restart the system to access the Setup utility.

You can also use the ASU program to configure the optional remote presence features or other IMM2 settings. The remote presence features provide enhanced systems-management capabilities.

In addition, the ASU program provides IMM LAN over USB interface configuration through the command-line interface.

Use the command-line interface to issue setup commands. You can save any of the settings as a file and run the file as a script. The ASU program supports scripting environments through a batch-processing mode.

For more information and to download the ASU program, go to http://www.ibm.com/support/entry/portal/docdisplay?lndocid=TOOL-ASU.

Updating IBM Systems Director

If you plan to use IBM Systems Director to manage the server, you must check for the latest applicable IBM Systems Director updates and interim fixes.

Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is described in this document.

To locate and install a newer version of IBM Systems Director, complete the following steps:

1. Check for the latest version of IBM Systems Director:
   a. Go to http://www.ibm.com/systems/software/director/downloads/index.html.

b. If a newer version of IBM Systems Director than what comes with the server is shown in the drop-down list, follow the instructions on the web page to download the latest version.

2. Install the IBM Systems Director program.

If your management server is connected to the Internet, to locate and install updates and interim fixes, complete the following steps:

1. Make sure that you have run the Discovery and Inventory collection tasks.
2. On the Welcome page of the IBM Systems Director web interface, click **View updates**.
3. Click **Check for updates**. The available updates are displayed in a table.
4. Select the updates that you want to install, and click **Install** to start the installation wizard.

If your management server is not connected to the Internet, to locate and install updates and interim fixes, complete the following steps:

1. Make sure that you have run the Discovery and Inventory collection tasks.
2. On a system that is connected to the Internet, go to http://www.ibm.com/support/fixcentral/.
3. From the **Product family** list, select **IBM Systems Director**.
4. From the **Product** list, select **IBM Systems Director**.
5. From the **Installed version** list, select the latest version, and click **Continue**.
6. Download the available updates.
7. Copy the downloaded files to the management server.
8. On the management server, on the Welcome page of the IBM Systems Director web interface, click the **Manage** tab, and click **Update Manager**.
9. Click **Import updates** and specify the location of the downloaded files that you copied to the management server.
10. Return to the Welcome page of the web interface, and click **View updates**.
11. Select the updates that you want to install, and click **Install** to start the installation wizard.

The Update*Xpress* System Pack Installer

The Update*Xpress* System Pack Installer detects supported and installed device drivers and firmware in the server and installs available updates. For additional information and to download the Update*Xpress* System Pack Installer, go to the System x and BladeCenter Tools Center at http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp and click **UpdateXpress System Pack Installer**.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated firmware and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/ to make sure that the hardware and software is supported by your IBM product.
- Go to http://www.ibm.com/supportportal/ to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
  - Hardware and Software Maintenance agreement contract numbers, if applicable
  - Machine type number (IBM 4-digit machine identifier)
  - Model number
  - Serial number
  - Current system UEFI and firmware levels
  - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request/ to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to IBM Support quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that

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contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/supportportal/. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at http://www.ibm.com/supportportal/. The address for IBM System x® information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/systems/intellistation/.

How to send Dynamic System Analysis data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM. Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/terms.html.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Creating a personalized support web page

At http://www.ibm.com/support/mynotifications/, you can create a personalized support web page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your IBM products. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/supline/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B. Notices

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Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1,048,576 bytes, and GB stands for 1,073,741,824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1,000,000 bytes, and GB stands for 1,000,000,000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from IBM.

Maximum memory might require replacement of the standard memory with an optional memory module.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as “total bytes written” (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. IBM is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the server to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the server, IBM may condition provision of repair or replacement of servers or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 14. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Documentation format

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when you use the PDF files and want to request a web-based format or accessible PDF document for a publication, direct your mail to the following address:

Information Development
IBM Corporation
205/A015
3039 E. Cornwallis Road
P.O. Box 12195
Research Triangle Park, North Carolina 27709-2195
U.S.A.

In the request, be sure to include the publication part number and title.

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Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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Responsible manufacturer:
International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:
IBM Deutschland GmbH
Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

Germany Class A statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

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Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

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Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

IBM Deutschland GmbH
Technical Regulations, Abteilung M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

VCCI Class A statement

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This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Japan Electronics and Information Technology Industries Association (JEITA) statement

高調波ガイドライン適合品

Japanese Electronics and Information Technology Industries Association (JEITA) Confirmed Harmonics Guideline (products less than or equal to 20 A per phase)

Korea Communications Commission (KCC) statement

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This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

People's Republic of China Class A electronic emission statement

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Taiwan Class A compliance statement

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居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

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